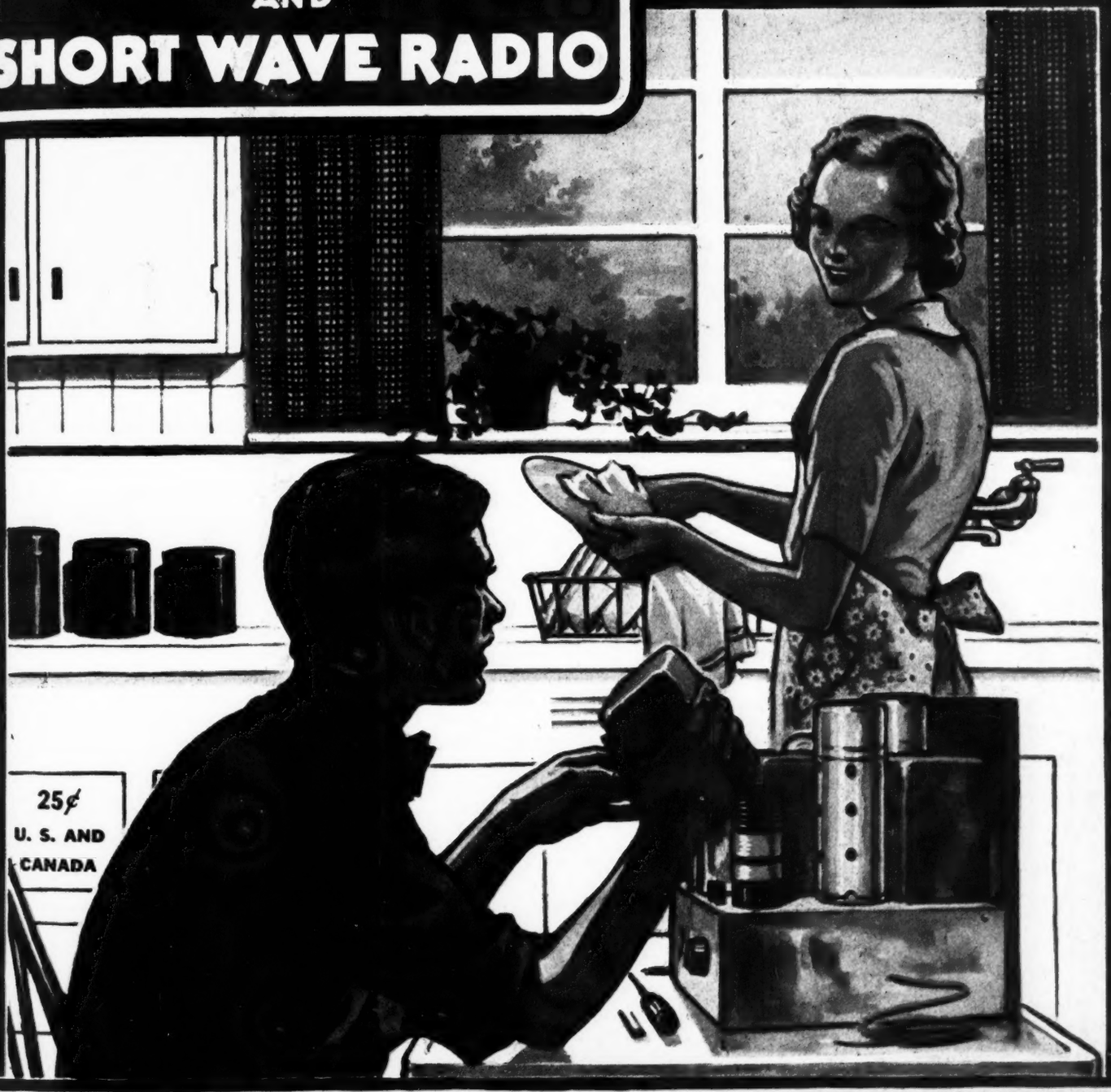
STARTING A SERVICE CAREER

SHORT WAVE TIME TABLE

# RADIO NEWS AND SHORT WAVE RADIO



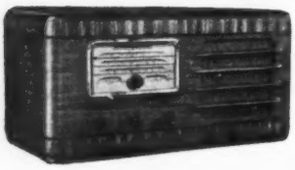

3 BAND SET

18 TO 110 METERS
BUILD IT AT HOME
AT LOW COST

# The Super Value Radio Buys of 1938

Here are just a few models from the new 1938 General Electric Radio line. You've never heard such thrilling, true-to-life, tone quality as you'll hear when you listen to these new radios with the new and exclusive G-E TONE MONITOR. It corrects tone distortion and brings out the high and low notes of each orchestral instrument. Stop in at your nearest G-E Radio Dealer for a demonstration.


**12 Super Value Models to Select from**

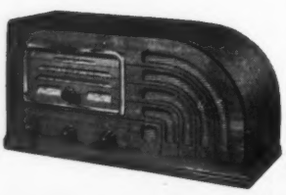


**MODEL F-70**

7 tubes. 3 bands. TONE MONITOR. Louver Dial. Foreign and American Stations—Police, Aircraft, Amateur Calls. Large Dynamic Speaker. 5 Watts Output.

**MODEL F-53**

5 tubes. 2 bands. Edge-lighted Dial. Domestic Stations—Police, Amateur Calls. Large Dynamic Speaker.



**MODEL F-63**

6 tubes. 2 bands. TONE MONITOR. Louver Dial. Foreign and American Stations—Police, Aircraft, Amateur Calls. Large Dynamic Speaker. 5 Watts Output.



**MODEL F-665**

6 tubes. 2 bands. TONE MONITOR. Louver Dial. Foreign and American Stations—Police, Aircraft, Amateur Calls. Large Dynamic Speaker. 5 Watts Output. "Armchair" Model.

**MODEL F-65**
(ABOVE)

6 tubes. 2 bands. TONE MONITOR. Louver Dial. Foreign and American Stations—Police, Amateur, Aircraft Calls. Large Stabilized Dynamic Speaker. 5 Watts Output.

The New GE **GENERAL ELECTRIC RADIO**

FOR REPLACEMENTS SPECIFY GENERAL ELECTRIC PRE-TESTED TUBES

J. E. SMITH
President
National Radio Institute
Established 1914
The man who has directed the home study training of more men for the Radio Industry than any other man in America.

# I WILL TRAIN YOU TO START A SPARE TIME OR FULL TIME RADIO SERVICE BUSINESS WITHOUT CAPITAL

## HERE ARE A FEW EXAMPLES OF THE KIND OF MONEY I TRAIN MY MEN TO MAKE

**EARNED $50 FIRST MONTH IN SPARE TIME**

"I knew nothing about Radio. After four lessons I began servicing Radios, earning $50 the first month. Last winter I made as high as $100 a month in spare time."—G. F. WALTON, 808 West Olney Road, Norfolk, Va.

**OWN BUSINESS PAYS $300 A MONTH**

"I now have my own Radio business which shows three hundred dollars a month profit—thanks again to National Radio." —FRANK T. REESE, 39 N. Felton St., Philadelphia, Penna.

**CHIEF OPERATOR BROADCASTING STATION**

"When I completed 20 lessons, I obtained my Radio Broadcast Operator's license and immediately joined Station WMPC, where I am now Chief Operator." —HOLLIS F. HAYES, 85 Madison St., Lapeer, Mich.

**EARNINGS TRIPLED BY N. R. I. TRAINING**

"I have been doing nicely, thanks to N. R. I. Training. My present earnings are about three times what they were before I took the Course. I consider N. R. I. Training the finest in the world."—BERNARD COSTA, 201 Kent St., Brooklyn, N. Y.

## Get My LESSON on Radio Servicing Tips FREE

I'll prove that my Training gives practical, money-making information, that it is easy to understand—that it is just what you need to master Radio. My sample lesson text, "Radio Receiver Troubles—Their Cause and Remedy" covers a long list of Radio receiver troubles in A. C., D. C., battery, universal, auto, T. R. F., super-heterodyne, all-wave, and other types of sets. And a cross reference system gives you the probable cause and a quick way to locate and remedy these set troubles. A special section is devoted to receiver check-up, alignment, balancing, neutralizing, testing. You can get this lesson Free by mailing the coupon.

**MAIL COUPON NOW**

The Tested WAY to BETTER PAY

Do you want to make more money? The world-wide use of Radio has made many opportunities for you to have a spare time or full time Radio service business of your own. Three out of every four homes in the United States have Radio sets which regularly require repairs, servicing, new tubes, etc. Servicemen can earn good commissions selling new sets to owners of old models. I will train you at home in your spare time to sell, install, service, all types of Radio sets to start your own Radio business and build it up on money you make in your spare time while learning. Mail coupon for my 64-page book. It's Free—it shows what I have done for others—what I am ready to do for you.

### Many Make $5, $10, $15 a Week Extra In Spare Time While Learning

Almost every neighborhood needs a good spare time serviceman. The day you enroll I start sending you Extra Money Job Sheets. They show you how to do Radio repair jobs that you can cash in on quickly. Throughout your training I send you plans and ideas that have made good spare time money—from $200 to $500 a year—for hundreds of fellows. My Training is famous as "the Course that pays for itself."

### There's a Real Future in Radio For Well Trained Men

Radio already gives good jobs to more than 300,000 people. And in 1936, Radio enjoyed one of its most prosperous years. More than $500,000,000 worth of sets, tubes and parts were sold—an increase of *more than 60%* over 1935. Over a million Auto Radios were sold, a big increase over 1935. 24,000,000 homes now have one or more Radio sets, and more than 4,000,000 autos are Radio equipped. Every year millions of these sets go out of date and are replaced with newer models. More millions need servicing, new tubes, repairs, etc. A few hundred $30, $50, $75 a week jobs have grown to thousands in 20 years. And Radio is still a new industry—growing fast!

### Get Ready Now for Your Own Radio Business and for Jobs Like These

Radio broadcasting stations employ engineers, operators, station managers and pay up to $5,000 a year. Spare time Radio set servicing pays as much as $200 to $500 a year—full time jobs with Radio jobbers, manufacturers and dealers, as much as $30, $50, $75 a week. Many Radio Experts own and operate their own full time or part time Radio sales and service businesses. Radio manufacturers and jobbers employ testers, inspectors, foremen, engineers, servicemen, paying up to $6,000 a year. Radio operators on ships get good pay, see the world besides. Automobile, police, aviation, commercial Radio, loud speaker systems are newer fields offering good opportunities. Television promises to open many good jobs soon. Men I have trained are holding good jobs in these branches of Radio. Read their statements in my 64-page book. Mail the coupon.

### I Send You Special Radio Equipment To Give You Practical Experience

My Course is not all book training. I send you special Radio equipment, show you how to conduct experiments, build circuits illustrating important principles used in modern Radio receivers, broadcast stations and loud speaker installations. I show you how to build testing apparatus for use in spare time service work from this equipment. You work out with your hands the things you read in the lesson books. My Free Book tells you about this 50-50 method of training—how it makes learning at home interesting, quick, fascinating, practical. Mail coupon.

### Save Money—Learn At Home Money Back Agreement Protects You

I am sure I can train you at home successfully. I will agree in writing to refund every penny you pay me if you are not satisfied with my Lessons and Instruction Service when you finish my Course. I'll send you a copy of this agreement with my Book.

### Find Out What Radio Offers You Get My 64 Page Book Free Now

Act Today. Mail the coupon now for my Free Lesson and my book, "Rich Rewards in Radio." Both are free to anyone over 16 years old. My book points out Radio's spare time and full time opportunities and those coming in Television; tells about my Training in Radio and Television; shows you letters from men I have trained, telling what they are doing and earning. Find out what Radio offers YOU! MAIL THE COUPON in an envelope, or paste it on a penny post card—NOW!

**J. E. SMITH, President**
**National Radio Institute,**
**Dept. 7JR**
**Washington, D. C.**


## GOOD FOR BOTH 64 PAGE BOOK SAMPLE LESSON FREE

J. E. SMITH, President, National Radio Institute, Dept. 7JR, Washington, D.C.

Without obligating me, send your Lesson "Radio Receiver Troubles—Their Cause and Remedy" and free book about spare time and full time Radio opportunities and how I can train for them at home in my spare time. I am particularly interested in the branch of Radio checked below.

( ) Radio Service Business of My Own
( ) Spare Time Radio Service Work
( ) Retail Sales of Radio Sets and Equipment
( ) Service Expert for Retail Stores
( ) Broadcasting Station Operator
( ) Aviation Radio Operator
( ) Ship Radio Operator
( ) Loud Speaker Systems, Installations and Service
( ) Auto Radio Installation and Service
( ) Television Station Operator
( ) Designing and Constructing Testing Equipment
( ) Service Expert with Radio Factory
( ) Commercial Radio Station Operator
( ) All-around Servicing Expert

(If you have not decided which branch you prefer—mail coupon now, for information to help you decide.)

NAME ..... AGE .....

ADDRESS ..... 14X1

# RADIO NEWS

*Edited by* LAURENCE MARSHAM COCKADAY

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WILLIAM B. EVERETT, *Art Editor*

Vol. XIX September, 1937 — No. 3


## *Reading Guide to this Issue—*



## *Next Month—*

A COMPLETELY self-contained receiver the size of an ordinary book and providing headphone reception of local broadcast stations is something that finds many useful applications. In the October issue such a receiver, so simple that anyone can build it, and so inexpensive that anyone can afford it, will be described in detail.

This will be just one of the many specially prepared and highly practical articles which will be presented, covering the entire field of radio.




*Published Monthly by* **Teck Publications, Inc.,** *Washington and South Avenues, Dunellen, N. J.*

EDITORIAL AND EXECUTIVE OFFICES
461 EIGHTH AVENUE, NEW YORK CITY, N. Y.

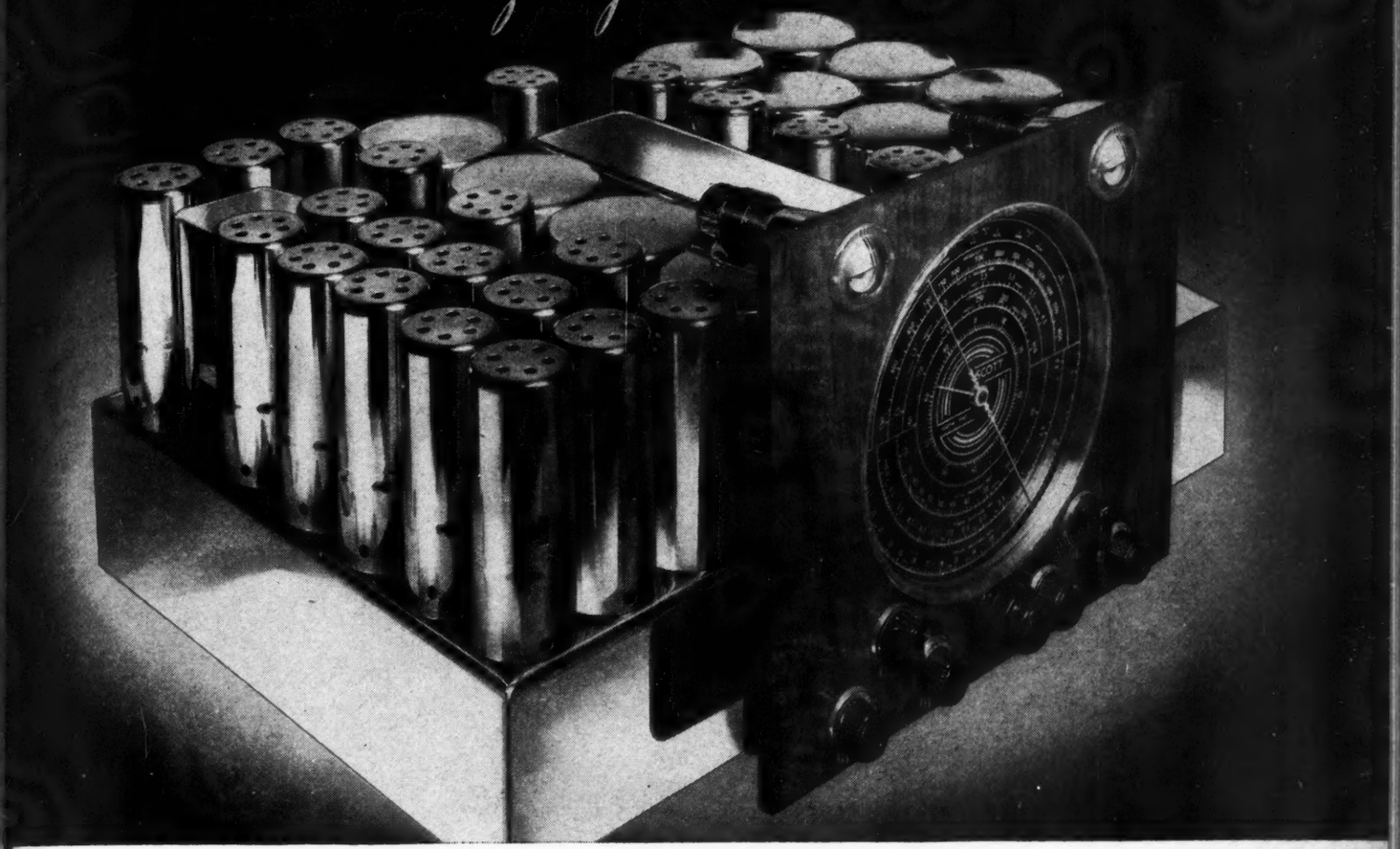
Lee Ellmaker, *President and Treas.*
B. Holcepl, *Secretary*
H. D. Crippen W. P. Jeffery, *Advertising Management*
Virgil Malcher, 205 W. Wacker Dr., Chicago, *Western Representative*

Entered as second class matter at the Post Office at Dunellen, N. J., under the act of March 3, 1879.



25c a copy. Subscriptions, $2.50 a year, $4.00 for two years; in Canada and Foreign Countries $3.00 a year, $5.00 for two years. Subscribers are notified that change of address must reach us five weeks in advance of the next date of issue.

# THE *Amazing* NEW SCOTT *Philharmonic*



# WORLD'S MOST POWERFUL RADIO!

The sensationally quiet long-distance performance and perfection of tone achieved by the New Custom-Built Scott "Philharmonic" is due to a large number of exclusive developments perfected in the Scott Research Laboratory. Following are a few highlights.

### Increased Wave Length Range 3.75 to 2000 Meters . . . Tunes Every Broadcast on the Air

The Scott "Philharmonic" has a tuning range from 3.75 to 2000 meters, making possible the reception of special Experimental and Television sound broadcasts on the Ultra-Short Waves—Foreign stations in all parts of the world—All of the stations on the standard Broadcast Band—Aviation and Weather reports on the Long Wave Band—*covering efficiently a greater wave length range, we believe, than any other radio receiver in the world today.*

### Super-Powered for QUIETER Foreign Reception from All Parts of the World

When you hear Foreign stations coming in on the New Super-powered 30 Tube "Philharmonic", you find it impossible to believe you are listening to stations thousands of miles away—*The extremely high degree of usable sensitivity on all wave bands is largely due to the efficiency of the highly developed Two Stage R.F. Amplifier—The Four Stage I. F. Amplifier—and the 40 Watt Class A Audio Amplifier.*

### New Variable Band-Pass Selectivity

On the New "Philharmonic" an exclusive method developed in our Research Laboratory continuously varies the Selectivity from 2 to 16 Kc., *enabling you to reach out and bring in weak distant stations which ordinarily would be completely blanketed by interference from powerful local stations on adjacent channels.*

### Four New Developments Revolutionize Tone—Amazes the Music World

Unquestionably, one of the *most* outstanding features of the Scott "Philharmonic" is the almost unbelievable realism of its tone. This is due largely to a number of recently perfected developments, among them: (1) New Scott R. F. Amplifier development (Scott Patents Applied For) which automatically band-passes the R.F. stages to 18 Kc. (on broadcast band) and variable I.F. Selectivity, *enables all frequencies up to 16,000 cycles to be reproduced, securing true high fidelity reception.* (2) NEW Scott Bass Bi-Resonator System (Scott Patents Applied For) *which provides perfect reproduction of bass or lower tones without muffling reproduction of speaking or singing voice on higher frequencies.* (3) Special Tone Balanced Volume Control *scientifically designed to follow response of ear to all frequencies at varying degrees of volume.* (4) New Inverse Feed-back System which automatically *cuts down "peaks" and brings up "dips" of speaker, giving finer, truer tone.*

### Perfected Push-Pull Volume Range Expansion

A special Push-Pull Program Volume Range Expansion circuit developed in the Scott Research Laboratory provides a range of 15db enabling the dynamic variations of all programs to be restored to their original volume range. *Until you have heard this new development, it is impossible to realize how fine both radio reception and phono reproduction can really be.*

### Newly Developed Circuit Suppresses Scratch On Phonograph Records

A development of the Scott Research Laboratory (Scott Patents Applied For) *automatically suppresses the scratch on the record, but does not affect the full reproduction of the higher frequencies at normal volume.* This amazing development for phonograph record reproduction cannot be realized until one has actually listened to a phonograph record played in the ordinary way, then with the record scratch eliminated. This is undoubtedly one of the most outstanding developments in phono reproduction.

### Guaranteed for 5 years Against Defects

The "Philharmonic" is custom-built in limited numbers, with such extreme precision and with such high quality parts, by highly skilled laboratory technicians, that it is guaranteed against defects (except tubes) for FIVE YEARS—20 times longer than the usual 90-day guarantee of production type receivers.

### Prices No Higher Than Many Ordinary Radios

Contrary to general opinion, Scott Receivers are priced no higher than many ordinary radios. They are sold only direct from the Scott Laboratories—there are no dealers—thus saving you the distributor and ordinary radio dealer's profit.

### 30 Day FREE Trial . . . Liberal Terms

*Try the Scott "Philharmonic" in your home for 30 days! If it is not finer and better in every way, you can return it at any time during this period and your money will be promptly refunded. Liberal Budget Plan terms, if desired.*

### Scott Demonstration Salons

**New York City**
630 Fifth Ave.

**Los Angeles**
115 No. Robertson Blvd.

**Chicago**
4440 Ravenswood Avenue

**FREE!** SEND COUPON FOR INTERESTING FREE DETAILS ON THIS SENSATIONAL NEW 1938 RECEIVER AND SPECIAL MONEY SAVING OFFER DURING THE NEXT 30 DAYS!

THE STRADIVARIUS OF RADIO RECEIVERS — SCOTT

## E. H. SCOTT RADIO LABORATORIES, INC.

**4440 N. Ravenswood Ave., Dept. 5P7, Chicago, U. S. A.**

**Please send full description, prices and FREE details on the special offer you are making during the next 30 days on the New Scott Philharmonic. No obligation. (Not sold thru dealers—sold only direct from Scott Laboratories).**

**Name**.....

**Street**..... **State**.....

# *Pages From A Serviceman's DIARY*


A SERVICEMAN HAS ONLY ONE PAIR OF HANDS

*In the radio service business small cuts and abrasions on the hands often occur and the serviceman, absorbed in his work, often neglects to protect them against infection. An infected finger, however, may put him out of commission for some time as far as repair work is concerned; even the smallest hurts should be immediately attended to.*

**TUESDAY:** When you find a customer at the door waiting for the shop to open, it a pretty good sign that the depression is over. And, perhaps, it might not be a bad idea to crawl out of bed a little earlier!

Here was a middle-aged man carrying a Radiola-80 power-supply and accompanied by a youngster holding the chassis. He thought it would be easy to take out the apparatus and run it down to the shop for test. Ordinarily, of course, it isn't much of a job for an experienced man but this was the first time the chassis had been pulled in seven years and getting out the rusted bolts caused him plenty of trouble. (I wish more customers would try jobs like this; they would understand better what a serviceman has to contend with.)

## "Shifting" Resistors

Brought the set in and put it on the test bench. It had already been examined, he said, by one of our competitors. The diagnosis was a blown condenser and the estimate for repair, twelve dollars. He wouldn't pay that much. Would rather buy a new set! (Filter condensers do not blow in this model, but customers become very critical of anyone who "knocks" a competitor and it is likewise poor policy to cut prices.) Perhaps, I told him, the other fellow had not had time to make a complete examination. Again, he may have figured on a complete overhaul, which takes plenty of time and materials for a thorough job. If he merely wanted the set patched up so as to get a little more service out of it, of course it would cost much less. I got the job.

Found the 110,000-ohm carbon resistor in the bleeder network had dropped to 15,000 ohms, overloading all the other resistors in the network. All had decreased in resistance to some extent, causing an excessive cathode bias on the r.f. and first i.f. tubes and of course making the set very insensitive. Replaced six resistors and soon had the set working like new.

## Emergency Case?

Loaded up the car to start out on calls and deliveries. With a chassis under one arm and a speaker under the other, I tried to open the car door. It stuck, and in pulling at it the speaker slipped. A lug on the output transformer ripped a nice, deep cut in my finger. I wrapped a handkerchief around the finger and started off.

Drove about a mile and noted that the handkerchief was getting blood-soaked. Stopped at a drug-store to have a fresh bandage put on but, after one look, the pharmacist told me to hurry over to the hospital and have the cut stitched. The hospital is last place in the world I should choose to visit—too often, the last place anyone does enter alive. However, here goes!

"Emergency case? Down the corridor, first door to your right," the nurse at the reception desk called out. I wandered into a small room where there was a nurse—all alone. Her boss certainly had an eye for beauty, and I began to like this hospital. She cleaned out the cut, then covered it with a piece of gauze saturated with some strong disinfectant.

"That's a very bad cut," she said, oh, so sweetly. "I'll get the doctor for you right away." She disappeared.

While waiting, a hard-boiled, middle-aged dame dropped in. She wrote down my answers to a long series of questions. Name, age, occupation, employer, business address, home address, nearest relative, religion—it got very monotonous.

"After all," I protested, "I've only scratched my finger. It isn't serious enough for all this."

## Most Encouraging!

"Of course not," she answered, then added significantly, "but we have to be prepared for any contingency." A nice, encouraging person! I wouldn't have been surprised if she had hauled out a tombstone catalog. I was glad to see her leave.

Ah! My nurse returned with a woman doctor in tow. And what a doctor! Tall and dark-haired, her clear, blue eyes bored through you. She took one look at the finger and then ordered the nurse to bring scissors, needles and other materials. (Boy, was I glad I hadn't cut my hip!) Strictly business, cool and efficient, she threaded the needle at the first try. A few quick stitches and the job done. (Could I look at her radio? No. It was all right. It would be.)

"Anti-tetanus serum," she ordered sharply. The nurse brought it.

"You should have an injection to prevent lockjaw," the doctor told me. (I don't like injections.)

"You don't want to get lockjaw, do you?" she asked.

"I wouldn't know," I told her. (After all, I'd never had it. )

"You wouldn't like it," she snapped, then turned on her heel and left.

The nurse gave me a shot in the arm, first scratching the skin and putting a drop of the serum on it to note the reaction.

"Don't you want a little stimulant?" the nurse asked, as I got ready to leave. (She *was* lovely!)

"Oh, well, if you insist," I told her, looking at a nice bottle of what looked like 17-year-old rye on the medicine shelf. But instead she took a small bottle of clear liquid and started to put drops in a glass of water.

"What's that?" I asked.

"Spirits of ammonia," she answered. "Sorry I can't give you anything else." (Her eyes were soft and brown. Could I look at her radio? Well, maybe—)

**THESE records from an anonymous serviceman's diary should be of decided interest to veteran servicemen, as well as to those whose experience in the service field is more limited. Written by a man who "knows his stuff," and shot with an occasional outcropping of humor, these items provide many hints not found in text books. More of these pages will appear from time to time.**

## Did You Pay the Social Security Tax?

Washington, D. C.—The Commissioner of Internal Revenue, Guy. T. Helvering, advises that immediate tax returns should be made by delinquent employers. Contrary to prevailing opinion, the tax is imposed on any employer of one or more persons and on the employee. The employer collects the tax from the employee and then becomes the custodian for the government. The employer is responsible for the collection of the tax and penalties for delinquency are levied against him, not the employee. Further information is available at the Collector's offices.

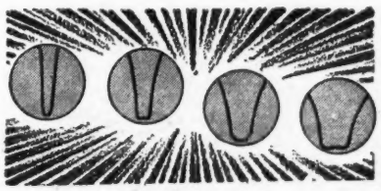
## PRA8

Pernambuco, Brazil—The Pernambuco Radio Club has arranged for the construction of new transmitting equipment to replace the present facilities. The new transmitter will have a power of 25 kilowatts. A long-wave antenna, consisting of a single 80-meter mast, will be used while the short-wave antenna is to be suspended between two 40-meter towers. The call letters and wavelengths remain the same: 410 and 49.67 meters.


It took twenty-six years experience building fine radio receivers to develop all the engineering superiorities combined in the New MASTERPIECE VI.

Imagine a radio so superbly *sensitive* that it will bring in stations all over the world using only an ordinary ice-pick for an antenna!

Imagine an altogether new idea in *selectivity*—the MULTI-BAND *interlocking* system—that gives you choice of *four* really startling degrees of selectivity at the flip of a switch! Imagine reserve *power* enough in your MASTERPIECE



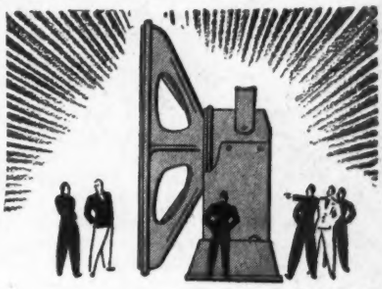
VI to use it as a Public Address system in an 18,000 seat auditorium!

Imagine the *tone* you get with BIFARIAN baffling, double tone controls, and the famous Jensen-McMurdo Silver 18" SUPER-GIANT twin-cone high-fidelity speaker!

Imagine a *control panel* allowing you to do everything that the broadcast station monitoring system can do!

Imagine all this coupled with the lowest tube and circuit noise found in any sensitive radio made today and you'll know why foreign reception is a pleasure with the MASTERPIECE VI — why engineers and scientific expeditions choose the MASTERPIECE VI.

Thirty-six distinctive technical features are built into your special and individually custom-built MASTERPIECE VI!



And it is shipped to you for a full thirty-day trial in your own home — with the sole judge as to whether it is "the finest receiver ever built."

And you can order your MASTERPICE VI on convenient monthly terms if you wish!

Write a letter or mail the coupon for complete technical details. Or see a MASTERPIECE VI on display at the Laboratories and Studio, 2900 South Michigan Boulevard, Chicago — or 63 Cortland Street, New York City.

"THE INDIVIDUALLY CUSTOM-BUILT RADIO"

MAIL THIS COUPON

McMurdo Silver Corp.
2900-A So. Michigan Blvd.
Chicago, U. S. A.

Please send me full details on the *New* custom-built MASTERPIECE VI.

NAME .....

ADDRESS .....

# DEPENDABLE PERFORMANCE


## NO SKINNY MICROFARADS in MALLORY REPLACEMENT CONDENSERS

P.R. MALLORY & CO. Inc

When you buy Mallory Replacement Condensers you get full capacity. There are no "skinny mikes" to account for . . . no *lean* performances to alibi.

The generous capacity of Mallory Condensers is important. So is the lower power factor. Together they mean improved filtering and better performance. And—better performance means better satisfied customers.

What is done to assure the *permanence* of Mallory Condenser characteristics?

Plenty!

The famous Mallory Metal Seal *hermetically closes* each Mallory Condenser against the effects of moisture and dryness.

That's why you can depend on Mallory Replacement Condensers for dependable performance any time, anywhere—at the seashore or in the Sahara Desert.

Mallory Replacement Condensers have established a position of national leadership in the service field—yet Mallory Replacement Condensers cost no more. The longer you use them the more readily you'll agree that they actually *cost less in the long run!*

### Are You Missing the Biggest Help a Service Man Ever Had?

Have you delayed asking the Mallory-Yaxley distributor about *your* copy of the MALLORY-YAXLEY RADIO SERVICE ENCYCLOPEDIA? See him now before the edition of this great book is exhausted.

Use P.R. MALLORY & CO. Inc. MALLORY REPLACEMENT CONDENSERS . . . VIBRATORS

Use YAXLEY REPLACEMENT VOLUME CONTROLS

Radio News

September, 1937

# *Starting A* SERVICE CAREER

This article is dedicated principally to the radio student shortly to be graduated from a service school. However, there is "meat" in it for everyone seriously considering going into the radio service business—the recent graduate, the student anywhere along in his course, the self-taught radio experimenter and the person with his eye focused pretty far ahead who has just begun to think about taking a radio service course.

*By* **Zeh Bouck**

THERE are three primary considerations involved in embarking upon a radio service career—no one of which can be subordinated to another. These are Training, Equipment and Capital. It is the purpose of this article to consider the *minimum requirement* of each.

Little can be said in an arbitrary way about training. If you have been graduated from the average residence school, or have plugged your way conscientiously through a correspondence course, you are doubtless sufficiently well trained to start in at radio servicing. If you have had no formal training, but can read through the average issue of RADIO NEWS with perfect understanding and are intimately acquainted with the theory and operation of essential service equipment through years of experience, you are probably on an equal footing with the person who can hang up a framed certificate in his service shop. Experience, of course, is a part of training—a vital part—but this, in many instances, may have to come later.

### Essentials

Your confidence in your own ability to repair radios is probably the best index of training. You, yourself, should know how good you are.

While the expert can cope with many radio service troubles with no more equipment than a screw driver and soldering iron, he can do a quicker and more effective job with the proper apparatus on hand. Also, there are numerous other difficulties to be considered. A large percentage of radio troubles is due to inefficient or inoperative tubes. Unless some definite symptom points in another direction, the serviceman's first suspicion is toward tubes, so *a tube checker is indispensable!*

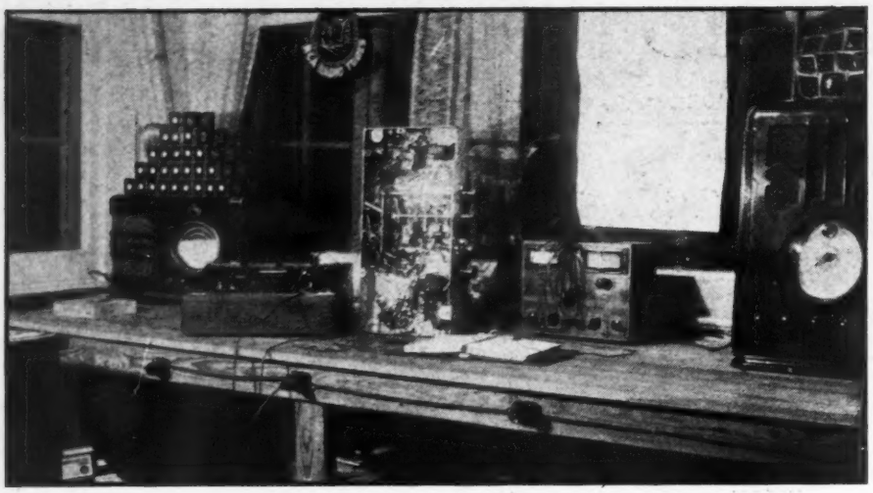
Once tubes have been eliminated as the source of trouble, the volt-ohmmeter is beyond dispute the most important of all service instruments. With it, better than 90 percent of all chassis troubles can be quickly and accurately detected and this may be written down as number 2 on the list of essential equipment. The *volt-ohmmeter is to the radio serviceman what the stethoscope is to the doctor!*

GOOD EQUIPMENT SMOOTHS THE WAY

*A young man with adequate training and well designed though not necessarily expensive test equipment can start out on his first service rounds with confidence that there is no service job that he cannot lick. After all, experience is another name for knowledge and servicing instruments are the necessary tools to work with.*

### Oscillators

While the all-wave oscillator will be brought into play on only a relatively small number of service calls, no serviceman worthy of the name should consider going into business without this instrument. And as the human ear is a notoriously unreliable device, an output meter should be employed with it. The illustrations show Clough-Brengle (Figure 6) Bendix-DayRad (Fig-

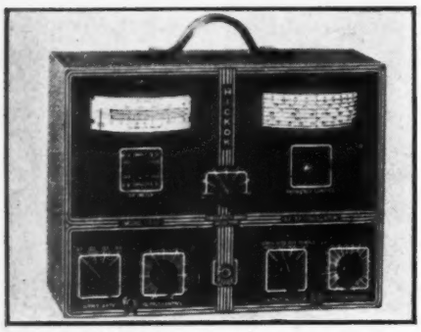


A HOME SERVICE BENCH

*According to a recent survey, about 60 percent of American servicemen work from their homes. The equipment shown above is portable and can be used on the Bench or in the field. This Bench was built at a surprisingly small cost of less than $4.*

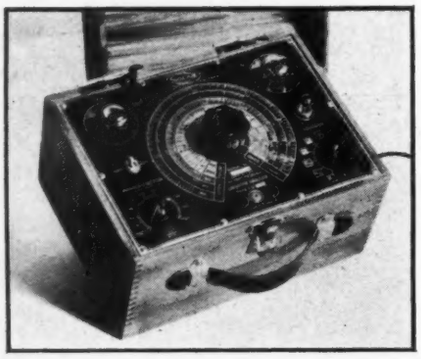
A UNIVERSAL TESTER

*Figure 1. The Triplett tube checker, volt-ohmmeter and output meter.*



AN R.F. AND A.F. OSCILLATOR

*Figure 2. The Hickok signal generator, a.f. oscillator and output meter.*

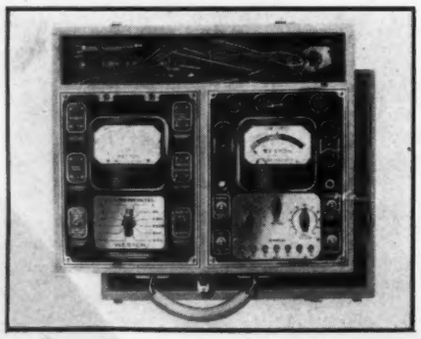


CAPACITOR ANALYZER

*Figure 3. The Solar capacity meter for measuring condensers and resistors.*

COMPLETE TEST INSTRUMENT

*Figure 4. The Weston "Serviset," which combines a tube checker, a volt-ohmmeter and an analyzer including an output meter.*



ure 5) and Hickok (Figure 2) models shown, are efficient and inexpensive.

Some means of measuring capacity and testing condensers also should be provided. The writer prefers the bridge for measuring condenser values, as power factor, which is an index of condenser deterioration, can be measured simultaneously. Also, such bridges are usually combined with a resistance bridge which provides an additional check on resistors and the volt-meter. For condenser leakage tests the neon flash-indicator is satisfactory and inexpensive.

## Combined Instruments

The foregoing covers the essential equipment—the very minimum which the serviceman should have to start in business. While we have by no means gone through the list of valuable service equipment, we are forced to pass over such useful devices as oscilloscopes, wobbulators, etc., until the cash register rings from pure force of habit.

Much of the above equipment can be obtained *in combinations which effect decided economies* without lessening the versatility of the apparatus. For instance. the tube tester may be combined with the volt-ohmmeter. Such a combination is the Triplett, Model 1504 Multi-purpose tester (Figure 1). Or a complete analyzer and tube checker may be combined as exemplified in the Weston Servicer (Figure 4).

It is similarly good sense to make a single unit of the condenser-resistor bridge and the condenser tester which is done in the Solar capacity analyzer (Figure 3). This instrument measures power factor, capacity, leakage and otherwise tests all types of condensers. A neon-lamp indicator is built into the bridge, which also measures a wide range of resistance values. Balance is indicated visually with a cathode-ray 6E5 tube.

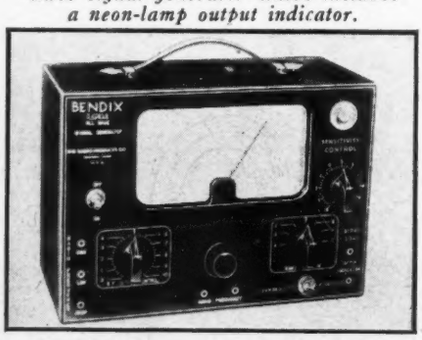
It may be argued that further economies could be effected if the serviceman built his own equipment. In the case of extreme economic necessity—yes. But otherwise, it is desirable that the serviceman's basic equipment be of commercial design. This equipment may be employed later as standards, against which shop apparatus may be calibrated, if personally constructed. However, in any event, homemade or factory-made, the minimum—essential—equipment remains as outlined above.

## Tools Required

Tools logically come under the heading of equipment and the essential implements are: soldering iron, three sizes of screw drivers (including a very small one for knobs), a small file, complete set of insulated screw drivers and wrenches for alignment work, long-nose pliers, diagonals, (*Turn to page* 188)

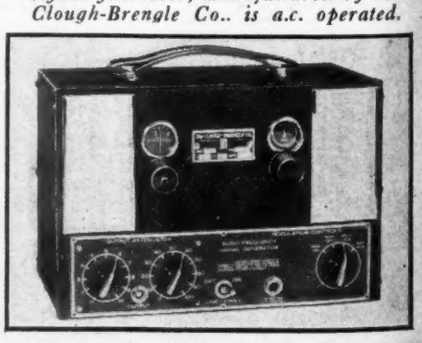
PORTABLE SIGNAL GENERATOR

*Figure 5. The Bendix-DayRad all-wave signal generator which includes a neon-lamp output indicator.*




RADIO-FREQUENCY GENERATOR

*Figure 6. This efficient, low-priced signal generator, manufactured by the Clough-Brengle Co.. is a.c. operated.*



# WHAT'S NEW in RADIO

## By The Associate Editor

### Complete Speaker Line

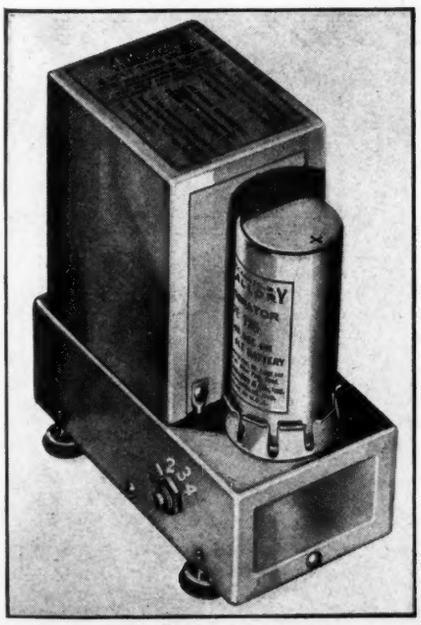
The Utah Radio Products Company line of permanent magnet dynamic type speakers has been expanded to meet practically all radio and sound system requirements. Thirty-four models are now available, with cone diameters ranging from 5 inches to 14 inches, employing magnets weighing from 5 to 46 ounces, and with output capacities as high as thirty watts. They point out that a new type of molecular structure in the speaker magnet greatly lengthens magnetic life.

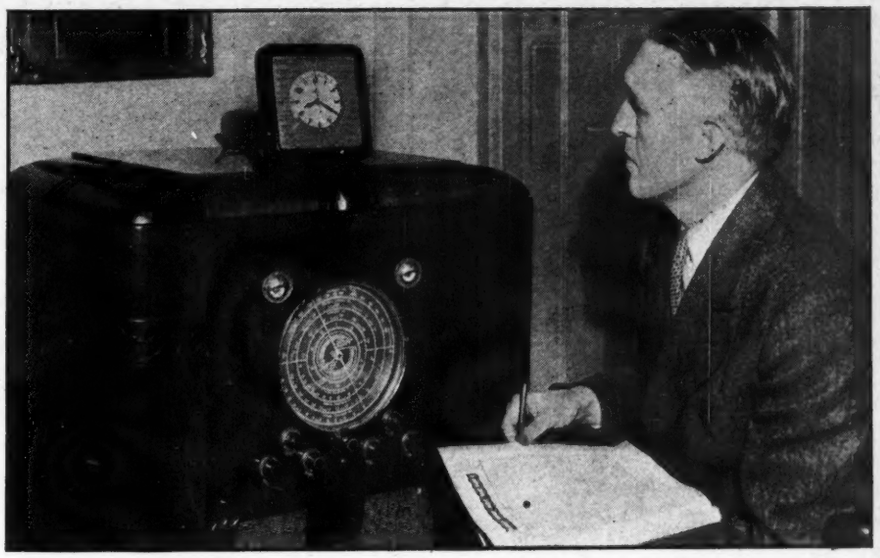
### Long-Range Auto Antennas

The General Electric Company offers four new auto radio antennas that require no drilling for mounting and meet practically all requirement for auto radio installation. They compromise the "Top-Flo" model KA20 designed for steel top cars. It is held in position by posts fitted with rubber suction cups which are cemented in place. There is the double "Hairpin" model KA40 antenna for under running board installation. the "Fish-pole" model KA30 which mounts on the rear bumper and the "Hinge-rod" model KA10 designed to be installed on the upper front door hinge.

### New Line of 6-Volt Power Units

P. R. Mallory and Company have introduced 6-volt power supplies called "Vibrapacks," designed to provide power for portable-mobile transmitters, P. A. equipment, and similar apparatus.





NOW, WHAT TIME IS IT IN BORNEO; IN TAHITI?

*Here is the new Warren time clock for the short-wave listener that tells at a glance the time around the world for any given local time. It would be a welcome addition atop any listener's all-wave receiver.*

The two high-voltage models have a maximum rated output of 300 volts at 100 ma. of easily filtered, rectified d.c. with three lower voltage taps of 275, 250, and 225 volts. Two low-voltage models deliver 200, 175, 150, and 125 volts output and may be used in converting 110 volt a.c. receivers for 6-volt battery operation. These power units are manufactured in both synchronous and non-synchronous types.

### Radio Interference Filter for Electric Razors

To overcome radio interference caused by the electric razor, the Solar Manufacturing Corp. has recently developed the "AE-Elim-O-Stat" filter of the capacitive-inductive type. It contains not only the conventional condensers usually used in devices of this kind, but also induction coils for maximum filtering effect.

### Permanent Sound System

This model 60-C amplifier manufactured by the United Sound Engineering Company

is a heavy-duty unit with a rated power output of 60 watts, providing gain of 135 db. on the three "mike" channels, and 61 db. on the phono channel. The tube equipment comprises four 6F5's, one 6R7, one 6F6, two 6E5's, two 6L6's, one 5Z3, and one 83. It can handle from two to thirty speakers for different reproducing requirements. For a high-powered amplifier the 60-C is unusually compact and convenient to handle. The two electric eyes, indicating overload and output level, provide a complete visual monitoring system.

### DX Listeners, Take Note!

This is the new Warren Telechron "Globetrotter" world time clock which gives you the time for all countries from Rangoon to Mandalay. The regular clock hands tell the time in your particular zone while the revolving outside numeral disc of 24 hours divided into dark for p. m. and light for a.m. shows at a glance the time in all sections of the world. It is modelled in walnut with bronze lacquered back and foot rest. The metal dial which is 5 inches square has black characters on a brown background. Dimensions 6⅜ inches square by 3 inches deep.

### Auto Whip Aerial for Increased Sensitivity

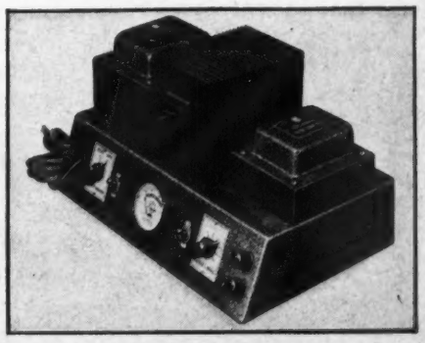
This new motor car antenna made by the General Antenna Company mounts on the door hinge and can be extended from 26 to 51 inches. It is equipped with 3-foot rubber-insulated shielded lead-in and is

made from triple plated rust-proof chrome alloy steel. The antenna is shown in the accompanying photo in a horizontal position, when erected it is mounted vertically.

### Auto-Radio Test Pack

The new Stancor power pack for auto-radios, just introduced by the Standard Transformer Company, is designed to meet the long-felt need for a dependable, accurately-metered source of low-voltage current for demonstrating and testing auto-radios.

This apparatus is supplied in three models with various ratings up to 8 volts at 15 amperes. Each model is protected with a circuit breaker in the primary and is equipped with an accurately-calibrated meter. (*Turn to page* 192)




# *Many Advantages in*

# OSCILLO

## *For Servicemen, Amateurs,*

Cathode-ray oscilloscopes at low-cost to meet the needs of any radioman. the new miniature cathode-ray tubes, available only in expensive laboratory oscilloscope design are included

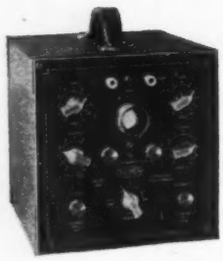
***By* William C. Dorf**

THE constantly increasing demand for reasonably priced test apparatus of greater capabilities has made possible quantity production of the modern, miniature cathode-ray oscilloscope. Now that its applications have become more widely understood, greater efficiency in the design, development and servicing of radio apparatus has been realized. Manufacturers today offer instruments which enable the user to obtain a picture of precisely what is taking place in receivers, amplifiers and transmitters so that defective conditions may be quickly recognized and the proper remedies applied.

Most of the newer instruments employ the 1-inch type 913 cathode-ray tube. More recently, a 2-inch type has appeared on the market and this has also been adopted by several manufacturers. In many of the instruments, either type tube may be used interchangeably. The low cost and long life of these tubes has made the new apparatus practical and economical.

For those who wish to build their own, complete kits of essential components have been made available. In both the completely manufactured and kit types, models are available with built-in sweep circuits and amplifiers as well as simpler types designed for use with external accessories.

The extremely wide variety of tests that the new cathode-ray oscilloscopes can be applied to, in experimenting, servicing and designing, has been covered in detail in the past six issues of RADIO NEWS. An excellent reference book on the subject is the "Cathode-Ray Tube at Work," by John F. Rider, and for the advanced student, there is "Engineering Mathematics," by Steinmetz.



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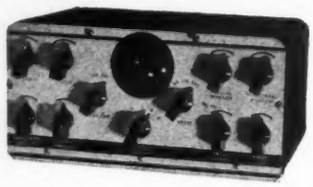

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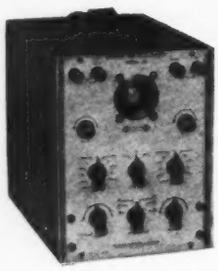

(3)

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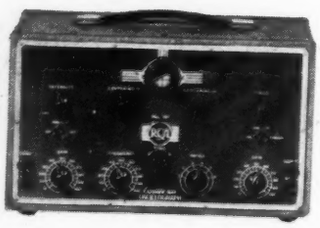
(5)



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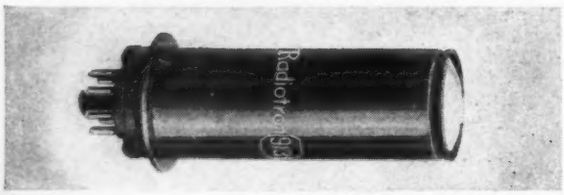


### Midget Oscillograph Easy to Operate

THE new midget cathode-ray oscillograph type 820 (see No. 1) was recently placed on the market by the Triumph Manufacturing Company. The nine controls on the panel are plainly marked as to their functions, and the design features make for simplified operation. After the preliminary adjustment of sweep frequency, beam control, and "locking" have been made it is only necessary to use the vertical gain and sweep vernier controls for final adjustments. The device can be used with or without its high-gain amplifier. The specifications show the instrument to be equipped with dual amplifiers, sensitivity 13 mm. per volt, and a linear sweep circuit rated 15 to 35,000 cycles. In addition to the 913 cathode-ray tube, the instrument uses a type 6A6, one 885, and an 80 type rectifier.

### Six-Tube Kit

THE compact and attractive-looking instrument in illustration No. 2 is the new Thordarson oscilloscope available in kit form. An unusually complete instruction folder with circuit diagrams and constructional illustrations are furnished with the kit. Careful thought was given to the preparation of this instruction sheet so that any experimenter, serviceman or amateur should have no difficulty in constructing the device. The case measures only 5⅛ by 6¾ by 10½ inches. It should be a handy portable unit for the serviceman. Six tubes in all are employed, consisting of one type 913 tube, two 6J7's, one 885, one 6X5 and one 1V tube.

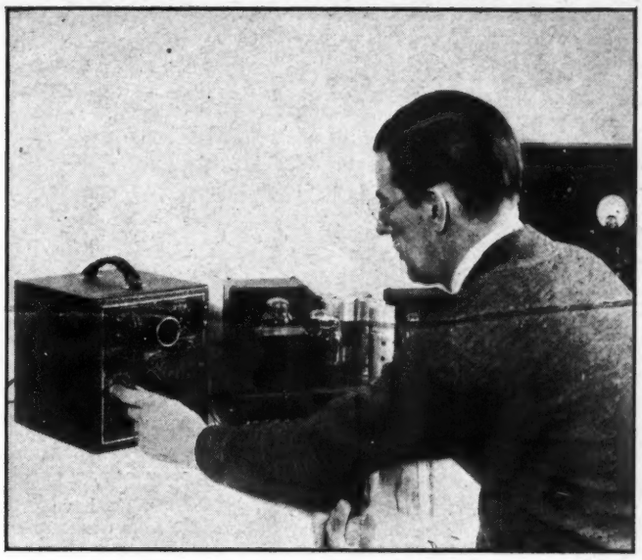
# *Midget Cathode-Ray*

# SCOPES

## *and Serious Experimenters*

are now obtainable in great variety
These new instruments, employing
incorporate essential features formerly
apparatus. The latest advances in
in the new types described

*and* **John H. Potts**



### 1001 Applications

THE Burton-Rogers model 60, five-tube oscillograph (see No. 3) is equipped with built-in amplifiers for both horizontal and vertical plates of the 913 tube. These amplifiers employ the 6C6 type tube. A linear sweep circuit is included, using the type 885 tube and an 84 is used for rectification. The manufacturer points out that only ½ volt input to either the horizontal or vertical amplifier gives a full-screen image. The linear timing circuit is of the latest design, employing the 885 tube to provide a synchronized saw-tooth wave so that stationary patterns of recurrent voltage or current conditions can be viewed on the screen. Other specifications follow: input impedance to either horizontal or vertical input posts, 1 magohm; maximum signal to input posts, 250 volts RMS. The overall dimensions of the case are: 8¾ inches high, 7 inches wide and 10 inches deep. It weighs approximately 11 pounds.

### Operates with Either 1- or 2-Inch Cathode-Ray Tube

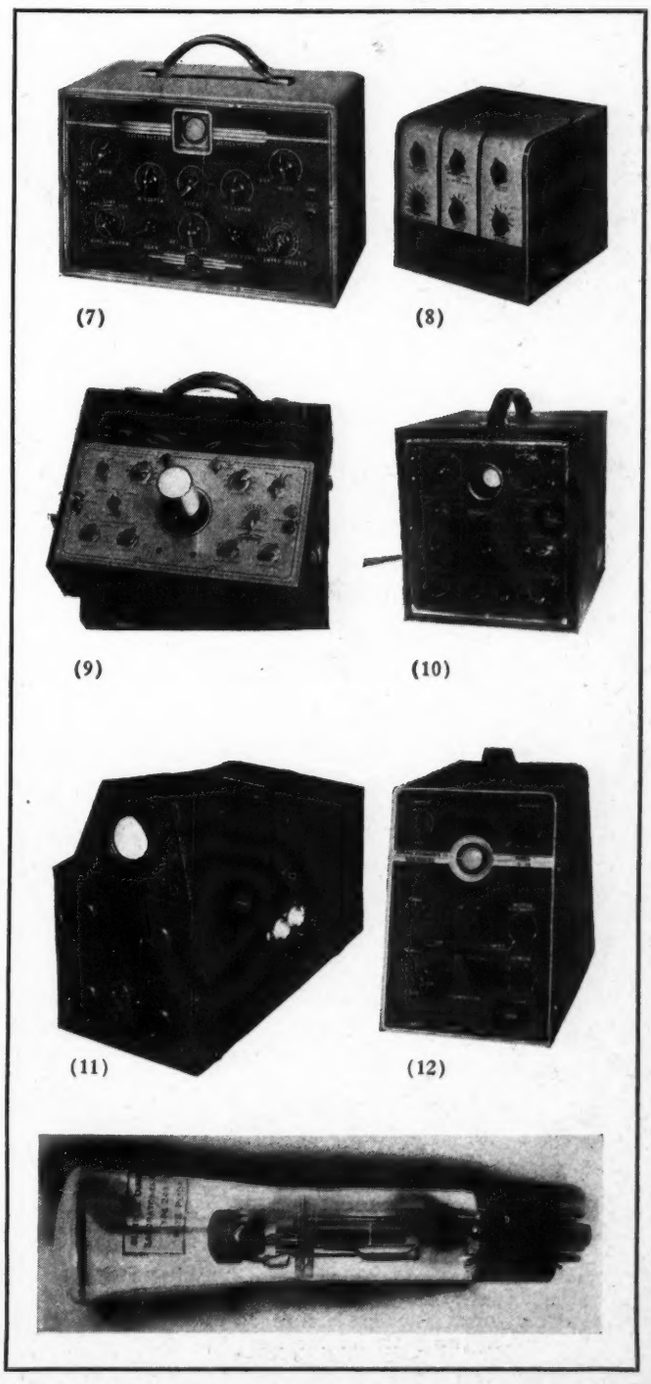
THE compact oscillograph shown in illustration No. 4 is the Hickok Junior oscillograph model RFO-3. It can be furnished with either a one- or two-inch cathode-ray tube. It is provided with a built-in electronic frequency modulator so that aligning may be done with an ordinary test oscillator. The tube screen is recessed behind the panel to keep out extraneous light. The manufacturer points out that the sweep circuit range is variable from 3 cycles per second to over 150,000 cycles. This is a seven-tube instrument using one 6J7 amplifier, one type 41 oscillator, one 6D6 frequency modulator, one 885 sweep circuit oscillator, one 6D6 current-limiting pentode, one 913 and one 1V rectifier.

### Employs New 2-Inch C.R. Tube

THE Supreme Instrument Corp. announces two new midget cathode-ray oscilloscopes employing the new 2-inch C.R. tube (see No. 5). Both instruments are portable and incorporate a number of new features of which the outstanding are an eliminator circuit for removing high-frequency linear sweep return, a selective return sweep eliminator for inclusion or rejection of power supply frequency return sweep, snap-lock synchronizer for positive interlock between linear time base and incoming signal. The rated linear sweep range is from 15 cycles to over 30 kc., sensitivity horizontal amplifier is approximately 1-7 peak volts, and of the vertical amplifier 1.8 peak volts, per inch deflection. Metal tubes are used in the amplifier circuits. The model 535 can be used for either single or double image alignment. A calibrated screen is furnished for use in connection with visual alignment work. The tubes employed are: one 6A7, one 6F7, one 84, and one 76.

### Meets All Amateur and Servicing Demands

THE illustration at the top of page 138 (and No. 6) shows the new RCA model 151 low-voltage oscillograph in operation at Harry Vierling's amateur station, W2CZD. He finds this instrument indispensable for (*Turn to page* 186)



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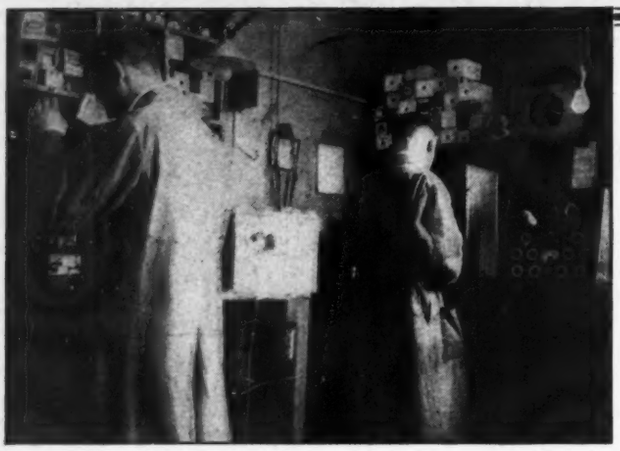


# The SERVICE BENCH

BRITISH SERVICEMEN AT WORK

*Figure 2: Servicemen in England are known as "engineers" and are remarkably careful and accurate.*

## GETTING AHEAD IN SERVICING

**IN choosing a business, career or profession, and even in service work a person should have not only a definite goal in mind but also a sane idea concerning the limitations of his possible advance.**

INEVITABLY in the mind of every serviceman and prospective serviceman there arises sometime the question "How far can I go in radio servicing?" As in every line of endeavor the answer depends largely upon the personal equation—how good a serviceman you are and your other individual qualifications. But there is this about radio servicing—*there is more room and at higher tops* than in other fields of comparable work. While everyone isn't going to get there, the possibilities in radio servicing are not exaggerated even in the most optimistic service school advertising. There are and will be plenty of Horatio Alger, Jr's. heroes climbing to the top.

### True Success Story

An example of what can be done, when industry, ability and imagination combine for progress, is exhibited in the case of Holiday & Hemmerdinger, of Manchester, England. Breaking into the game from scratch—or better yet, let Mr. Hemmerdinger tell the story: "Starting in August, 1932, in a small room, the writer and his partner aimed to provide a first-class service for repairs and public address. The business grew rapidly and soon it became necessary to knock down a wall to increase the size of our workshop. Further space was taken for the office and, later still, more accommodation was required for our expanding public-address department. The original staff of *two* was gradually added to, and is now *seven!*

"Our equipment was consistently augmented, and we now have everything from a capacity bridge down. Repairs are undertaken for private customers as well as for the trade. Where desired, an estimate is submitted on a special form which provides a comprehensive idea of just what has to be done and what the charges will be. Every job is given a job number, and a card marked with this number accompanies the repair through the works. Thus instant reference can be made to the progress of any particular job.

"Considerable attention has always been given to advertising and our stationery. We advertise consistently in local and national journals. This year, for the first time, we have published a catalog, which has been sent to some 1700 dealers within 25 miles of Manchester.

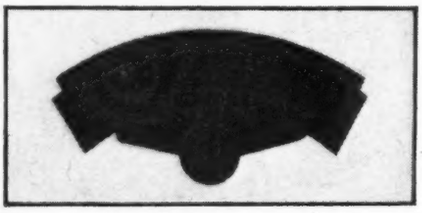
"We attribute much of our success to living up to our motto—*'The Golden Rule of Servicing—Never take anything for granted.'*"

Figures 1 and 2 are different views of the Holiday & Hemmerdinger Service Shop. Figure 3 shows the Sound Truck ready for the road, while Figure 4 is a photograph of a remote set-up with a portable power supply comprising a gas engine and generator. The letterhead of Figure 5 is exceedingly attractive. The paper is of excellent quality and the lettering is engraved. It is printed in two colors—a light green wash across part of the black lettering and a darker green border. Figure 6 shows two small stickers useful in many ways. That of Figure 6A is printed black on metallic gold, giving the impression of an etched plate.

In the course of expansion, Holiday & Hemmerdinger took on the agency for various English-made parts and accessories as well as some American products such as the Solar condenser and resistor bridge. The catalog to which Mr. Hemmerdinger refers runs twenty pages, including heavy paper covers. H. & H. function as jobbers for these products—an arrangement that might not be practical for most servicemen in this country, though workable in some of the larger communities.

FIGURE 6

*Two stickers—for tubes, radio receivers and general electrical work.*




### A Record Department

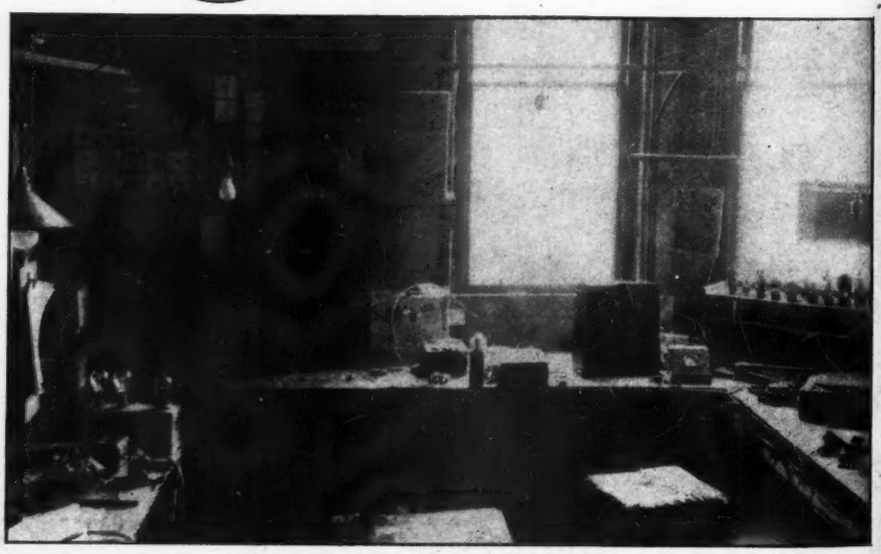
Consistent with their progress, Holiday & Hemmerdinger have recently opened a new department devoted to "gramophone recording." They sell and rent recording equipment—from the inexpensive home-recording variety to the professional jobs—process records at nominal cost and carry a complete stock of records and recording accessories.

With all this expansion, the service department necessarily functions on a larger scale and there is now on file over 10,000 circuit diagrams of English and foreign receivers.

Nothing succeeds like success! The SER-

A SERVICING SHOP

*Figure 1: A fair-sized room with plenty of light and the Service Benches extending around on all sides is the way the English Serviceman lays out his workshop.*



THIS MONTH

*Succeeding in Service Work . . . Permanent-Magnet Dynamics . . . Noisy Volume Controls . . . Distortion . . . Auto Radios . . . Service Kinks . . . Service Notes . . . Belmont . . . and Philco . . .*

## *By* Zeh Bouck, *Service Editor*


"VAN" FOR PUBLIC ADDRESS

*Figure 3: Otherwise known in America as a sound truck, this photo illustrates its British equivalent.*

VICE BENCH always welcomes success stories from its readers from all over the world—and will pay for them. Send in your own story—as an inspiration to those lads who are still climbing.

## THE DAY'S WORK

Harry D. Hooton, veteran contributor to this department from Henderson, West Virginia, sends in the following notes from his service case book, starting with—

### Notes on P. M. Dynamics

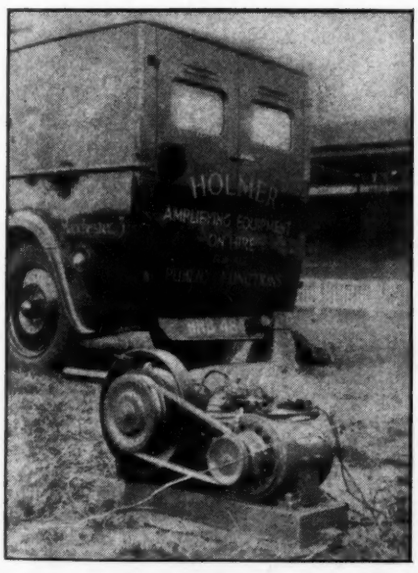
"The advent of the new low-cost, permanent-magnet dynamic speakers offers the serviceman an opportunity to cash in on speaker sales to both battery-operated and a.c.-d.c. set owners. Frequently, however, when replacing the ordinary magnetic type of speaker with the dynamic, especially in battery-operated receivers, unexpected difficulties may arise. For apparently no reason whatever, distortion, audio howls and interference may be encountered.

"The distortion is usually caused by a mis-match between the speaker output-transformer and the tube or tubes in the receiver. Most of these dynamics are equipped with a universal transformer and instructions for the proper matching with tube impedances are included. If the instructions have been carefully followed and the distortion still takes place, a paper or mica condenser of from .002 mfd. to .03 mfd. placed, directly across the primary of the output transformer, will usually eliminate the trouble. In Class B circuits, a fixed resistor of about 5 to 10 times the plate impedance of the output tubes should be connected across the transformer primary. It may be necessary to employ a fixed condenser here also.

"The audio howl is usually due to a microphonic tube, shield, condenser or volume control. Because of the wider frequency response obtained with the dynamic speaker, rattles and howls of this kind are often present even though they were not experienced with the magnetic speaker. Although it seems strange that interference can develop through a change of speakers, this sometimes happens, and for similar reasons. In most cases of this kind, the tuner or i.f. circuits will be found to be *out of alignment* and the dynamic speaker merely reproduces the interfering signal which was cut off by the limited frequency-response of the former speaker. Obviously, a careful re-alignment of the receiver is in order.

ON LOCATION

*Figure 4: Gasoline-driven power plant set up for action for furnishing power to the sound truck.*




### Noisy Volume Controls

"Many volume controls become noisy because of wear on the shaft collar or bearing. A simple method of repair is to wind fine bare wire on the shaft, between the collar and bearing, and then flow it full of molten solder. Rotate the shaft back and forth until the solder cools in order to prevent the shaft being locked.

### Distortion in Battery Sets

"Many battery operated receivers using type 19 output tubes may have considerable distortion when the B-battery voltage begins to drop. The 19 stage usually is biased 6 volts negative. Reducing this bias to 4½ or even 3 volts will restore a proper grid-plate voltage balance and the distortion will disappear. (How about selling the customer a new set of B batteries, Harry? —Ed.) Distortion or fading can also be caused by incorrectly connecting the a.f. amplifier grid-returns to the C battery that supplies bias to the r.f. or i.f. tubes under a.v.c. action. In this case, the a.f. bias fluctuates due to the additional bias supplied by the a.v.c. circuit."

### P. M. Dynamics for Auto Radios

Harry Hooton's comments, above, on permanent magnet dynamics, may be of interest to servicemen who followed the tip submitted by A. F. C., Rochester, N. Y. A. F. C. has been contacting all his old customers of auto radios, suggesting that he install P. M. dynamics in place of regular dynamics obtaining their field supply from the 6-volt battery. *Reduced drain on the battery* and *better quality* are his principal sales arguments. There is no question that auto batteries are not standing up the way they should under the heavy charge-and-discharge rates imposed by auto radio installations. A local battery station co-operates with A. F. C. and gives him plenty of hot tips—for a 10 percent commission on every resulting P. M. sale.

As for improvement in tone, the newer speakers are generally superior to those supplied with auto radios a year or so back. The improvement is particularly to be noted when the speakers are substituted for the old type, integral with the receiver under the dash and ear-level mounted for better sound distribution.

### Auto Radio Tool

"Ever try to pry the lid off an auto radio set with a regular screw driver—when you can't get the handle far enough back on account of the fire wall or some other obstruction? And once you got the lid off, did you ever try to take the tubes out? To remove tubes from most auto radios you need a hand the size of a baby's and the strength in the fingers of Goliath! Take a screw-driver and bend the end as shown in Figure 7. File to a knife edge.

(*Turn to page* 166)



FIGURE 5

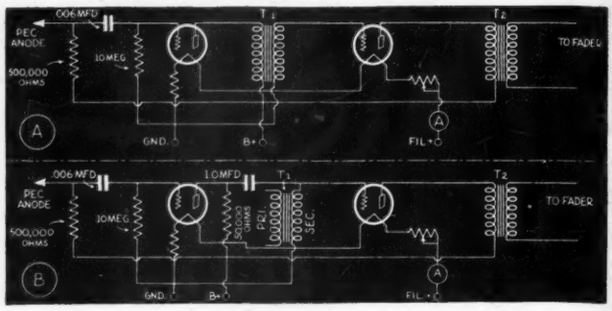
*Nothing neglected even to the smallest detail in a handsome letterhead*

# *Some Real Practical Pointers For Servicemen On* Servicing MOVIE SOUND

## *(Worthwhile Short-cuts)*

**By W. W. Waltz**

*(Part Two)*




CIRCUITS FOR THE PHOTOCELL AMPLIFIER
*Figure 3. At A is shown the circuit as originally connected, and at B the circuit modified for use with high-output cells.*

**SOME of the remarkably simple trouble-shooting tests employed by experienced sound engineers are described this month. These pointers will help to smooth the way for servicemen about to enter this fascinating and profitable field and also prove of real value to the specialist in sound movie servicing.**

A BLOCK schematic diagram in Figure 2 shows an old type of system in which batteries were used for PEC (photo-electric cell) voltage, PEC amplifier voltages, filament supply for the voltage amplifier, and field current for the horn units. More recent systems dispense entirely with batteries, using rectifiers—generally of the copper-oxide type—for the low-voltage circuits, and vacuum-tube rectifiers for plate supply. However, with the exception of the elimination of the batteries—and perhaps the photocell amplifier—present-day systems are not different, in layout, from those of five years back. True enough, more compact units are the order of the day as is the gradual elimination of the disc reproducing equipment, but many theatres are operating today with apparatus no more modern than that sketched and, to be unprepared to handle a trouble call on this vintage equipment is as inexcusable as the inability to service a 1929 model radio set.

### Localizing Trouble

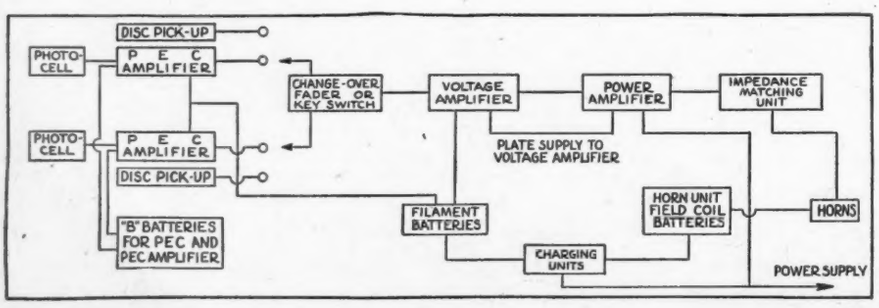
Familiarity with a diagram such as that of Figure 2 will aid greatly in making what the medical profession terms "differential diagnoses"—that is, locating the exact trouble by systematically eliminating each part until the defect is found. Unless the trouble is quite obvious, this is the only quick method of going about the work. Obviously though, there is no *rational* in carrying this system to extremes. A headset across the output of each amplifier in the chain, starting with the PEC amplifier, will quickly show up any trouble and materially assist in further localizing it. (*An indispensable aid for these checks is a headset—high impedance, of course—with a cord sufficiently long to reach from the amplifiers to the machines. Twenty feet is a good length*).

### Checking Amplifier

If the background noise of the amplifier is insufficient to enable one definitely to determine if the amplifier is functioning, some means must be provided to interrupt the light from the exciting lamp in order that the "thump" may be heard. With a long cord on the headset, the serviceman may be at one of the machines, flicking a pencil, or his finger, through the beam of light, while the headset may be connected at whatever point in the circuit is necessary.

Of course, a defective photo-cell will act to prevent this "flicking" test becoming audible; hence the advisability of starting with the PEC amplifier. The gain of these amplifiers is usually quite low—about 25 db; the output of the photocell being about 50 db (zero level 6 milliwatts)—and care must be taken to distinguish the characteristic "thump" of the interrupted beam of light when listening to the output of the PEC amplifier. Most troubles at this point in the circuit are due to low PEC batteries, loose connections or improper focussing of the exciter lamp.

TYPICAL SOUND SYSTEM
*Figure 2. A schematic block diagram of a theatre movie sound system.*




### Correcting Faults

A typical photocell amplifier, such as used with the older models of equipment is shown in Figure 3. These amplifiers were modified, in many cases, in accordance with the circuit of 3(B) when the advent of the higher-output, caesium-oxide cell made it desirable to reduce the gain of the first stage and, consequently, the noise level of the entire system. The most common and most annoying source of trouble with this part of the system—excepting microphonic tubes—is caused by the lead which runs from the junction of the 500,000-ohm resistor and the .006-mfd. blocking condenser to the anode of the photocell. This lead, necessarily very flexible, is "hot"; the capacity between it and ground—represented by the framework of the projection machine—is usually varying due to the vibration of the projector. The impedance of this lead-to-ground capacity is of the same order of magnitude as that of the Photocell. The resulting, variable-shunting impedence serves to promote loss of high frequencies. The remedy is in keeping this lead just tight enough to prevent excessive vibration and at the same time, not so tight that vibration from the machine can be transmitted to the first tube of the amplifier. The insulation on this lead often absorbs oil dripping from the projector head. This is an elusive source of miscellaneous noise which is often blamed on everything but the real source of the trouble. Replacement of the oil-soaked lead usually results in a marked improvement. However, in making a replacement, extra flexible wire (65-strand, double-silk-insulated) is necessary. Ordinary fixture wire is entirely too stiff for use here. Where possible, it is well to run this wire in such a way it is at least ¾ inch from the nearest grounded metal surfaces. Generally, these amplifiers and their mountings were designed with this spacing in mind.

Other amplifier (*Turn to page* 187)

*Big-Screen*

# Television *Pictures*

One of the oft-repeated criticisms of cathode-ray television has been that the pictures on the screen were not large enough. Here is a new cathode-ray gun which reproduces really large images.

***By the* Television Reporter**

A 3 BY 4 FOOT TELEVISION PROJECTION

*Dr. R. R. Law shows a television image projected on a large screen by his new Kinescope cathode-ray system.*

AN electronic gun capable of projecting television images of a size and quality comparable to home movies was demonstrated by RCA engineers at the recent Institute of Radio Engineers Convention in New York. The gun is a tube about 18 inches long and produces an image about 1½ by 2¼ inches on its self-contained fluorescent screen; this is brilliant enough to permit simple optical projection on a large-sized external screen. Its projected image of 18 by 24 inches is similar in brightness to average home movies. An image blown up to 3 by 4 feet was shown the engineers and the brightness was sufficient to make the picture visible to the large assemblage.

### Brighter Pictures

The electron gun, the highlight of the demonstration, was developed by Dr. R. R. Law and his associates at the RCA Harrison, N. J., laboratories.

It was pointed out that in projection it is necessary to start with a much smaller and brighter picture than with the average cathode-ray tube where the image is viewed right off the valve itself. Hence, the brightness is dependent on the current in an extremely slender beam focused by the flying electrons in the tube and the smaller picture needs increased beam current.

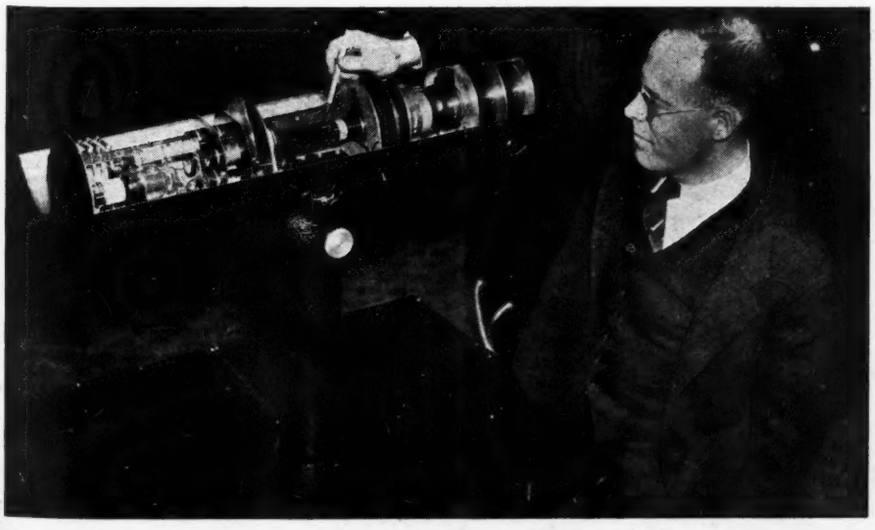
The electronic gun called for such rigid specifications that the plan was almost dropped as impracticable. The electrons must be regimented into a solid shaft of a narrow beam to pencil the received image sharply on the cathode-ray tube's fluorescent screen; the electrons are prepared for the task by being passed through three metal disks, each having center openings about the size of a pin-head. They then penetrate a fourth disk with an opening too small to pass even a thread.

Being forced through this tiny aperture, the electron bombardment is so intense that the light produced on the screen of the projecting tube is strong enough to be spread over an external screen area 100 to 400 times greater.

While the demonstration was impressive, it was declared that the device would not be incorporated in home model television sets at the present stage of development, the achievement being confined to laboratory equipment and conditions.

"SHOOTS" TELEVISION IMAGES

*The Electronic gun which projects television scenes on a big screen is shown here with its cover open as Dr. Law points out the special cathode-ray tube which is the heart of the system.*



### Research Continues

Development of the projecting tube has brought about research to produce a luminescent material capable of withstanding the terrific electronic bombardment and work on this was still going on at the time of this writing.

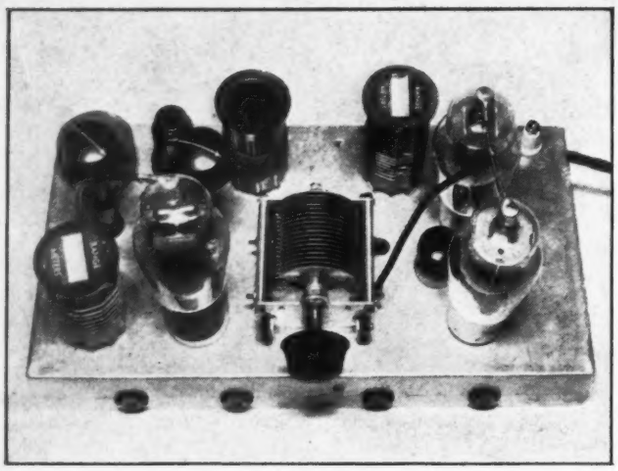
The Law projector was demonstrated on the arbitrary American standard of 441 lines. At the convention, Mr. C. E. Burnett, of RCA, described methods by which the Kinescope tube may be quickly tested for qualities of faithful image reproduction.

His method called for a specially generated set of impulses instead of usual image signals. Since the cathode-ray receiving tubes are most susceptible to distortion when recording impulses at a high frequency, the test current was set to provide a pattern at the valve's upper limit of frequency reproduction; the resulting very fine, polka dot pattern was described as the same that might be obtained if a half-tone photo-engraving were made of a blank sheet of grey paper.

The irreducible minimum of reproduction on the 441-line standard is represented by such a pattern and, if the tube performs with uniform response at this frequency, Mr. Burnett pointed out that it can be trusted to record larger areas of light from a televised subject with at least equal fidelity.

### Outdoor Pick-ups

According to a report by R. B. James, Harley Iams and W. H. Hickok, RCA engineers, on the relation of outdoor illumination to television pickups, it is believed that present television pick-up equipment is sufficently responsive to light to be generally successful for baseball, which is played in the brightest months of the year (*Turn to page* 173)



SIMPLE—NEAT

*The chassis for the all-band transmitter is easy to make and efficient in operation.*

# The "HAM" Shack

*Conducted by*

**Everett M. Walker**

**Editor for Amateur Activities**

# *Simple* All-Band *Transmitter*

**IN the April issue of RADIO NEWS we described a "sure fire" five-meter master-oscillator-power-amplifier transmitter using 6L6 type tubes. This transmitter proved so effective on this band that it was decided to design and construct a companion crystal-controlled transmitter for use on all other bands, making use of the available power supply and modulator equipment. The transmitter that was evolved proved far more effective than we first anticipated.**

DESIGNED to fit in the same size cabinet as the "sure-fire" unit, this multi-transmitter is extremely compact. As this seems to be the trend in amateur transmitter construction, both those who decide to construct a similar unit and those who are just looking for applicable ideas will find, it is hoped, many useful construction ideas in this unit.

In planning it, tubes were selected that would give the greatest amount of output possible with the power-supply equipment available. Accordingly a type 6C5 metal tube was selected for the crystal oscillator stage; an 802 for the buffer stage and a pair of 807s for the final amplifier. The crystal oscillator is a hybrid arrangement of the 6C5-6L6 "Les-tet" oscillator developed by Frank Lester. It differs from his original circuit in that an 802 tube is used in place of a 6L6. This change was made for several reasons. First, no neutralization is required with the 802 and in view of the fact that the transmitter was designed primarily to operate on the lower frequency bands where the intermediate tube was to be employed as a straight buffer, this tube offered some advantages.

The 802 is an excellent buffer tube for all frequencies up to about 30 megacycles. Further, it requires no more driving power than the 6L6, and while not capable of quite as much output, it has ample to drive a pair of 807s.

EFFECTIVE PORTABLE AERIAL

*Pictured below is the portable mobile outfit of Byron H. Kretzman, W2JTP, of Hempstead Gardens, Long Island, known to his friends as "Doc". The 5-meter antenna shown at the left folds up and can be packed away in the car in only a few minutes.*

## Beam-power Tubes

The beam-power tubes were selected for the amplifier stage because of their low-voltage, high-output ratings and small drive requirement. The internal capacities of these tubes are extremely small and therefore there is no disadvantage in using two of them in parallel even at 30 megacycles.

This transmitter is capable of delivering about 40 watts into the antenna without overload, and even slightly higher outputs may be obtained by crowding the tubes a little more. Their normal input rating is 400 volts at 180 milliamperes, although with the modulator available, only slightly more than 20 watts of audio power is available, and therefore the input for phone operation was limited to about 40 to 50 watts.

Compactness without the sacrifice of efficiency was the first consideration in planning the transmitter. The entire unit is mounted on a chassis 7 by 13 by 2 inches. The oscillator and buffer stages are mounted in a space 5 by 7 inches at the left of the chassis and the remaining space is reserved for the final amplifier components. In order to save as much space as possible and at the same time keep the leads short, the tuning condensers for both the oscillator and buffer stages are mounted through the chassis and adjacent to their respective coils.

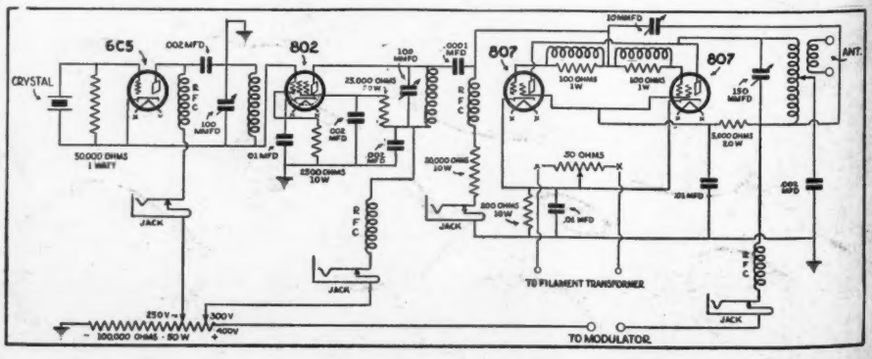
The crystal itself is mounted at the left-rear portion of the metal chassis. To its right is the 6C5 and next to the metal tube is the oscillator plate coil. The oscillator tuning condenser is mounted almost directly in front of the oscillator tube, and the buffer tuning condenser is at the left. Insulated shafts are coupled to these two condensers so they may be tuned without reaching down near the chassis where the hand might have some effect on the tuning (See photo). The buffer coil it at the front left corner of the chassis and to its right is the 802 buffer-doubler tube. All of the wiring for these stages is done beneath the chassis. The sockets used are of the type that may be mounted through the chassis and attached with springs that keep them snug.

## Everything Rigid

All of the components such as resistors and condensers are mounted either on brackets or to the tube socket terminals so that everything is rigid. Incidentally, the oscillator tuning condenser is mounted directly on the chassis, its rotor plates being grounded. The buffer condenser, however,

**COIL DATA FOR 807 TRANSMITTER**

| BAND | OSCILLATOR COIL | BUFFER COIL | AMPLIFIER COIL |
|---|---|---|---|
| 160 λ | 50 TURNS No 22 D.C.C. WIRE CLOSE-WOUND 1½" FORM | 50 TURNS No 22 D.C.C. WIRE CLOSE-WOUND 1½" FORM | 34 TURNS No 18 D.C.C. WIRE CLOSE-WOUND 2¼" FORM |
| 80 λ | 21 TURNS No 22 D.C.C. WIRE CLOSE-WOUND 1½" FORM | 21 TURNS No 22 D.C.C. WIRE CLOSE-WOUND 1½" FORM | 12 TURNS No 18 D.C.C. WIRE CLOSE-WOUND 2¼" FORM |
| 40 λ | 12 TURNS No 22 D.C.C. WIRE DOUBLE-SPACED 1½" FORM | 12 TURNS No 22 D.C.C. WIRE DOUBLE-SPACED 1½" FORM | 12 TURNS No 18 D.C.C. WIRE DOUBLE-SPACED 1½" FORM |
| 20 λ | 6 TURNS No 22 D.C.C. WIRE DOUBLE-SPACED 1½" FORM | 6 TURNS No 22 D.C.C. WIRE DOUBLE-SPACED 1½" FORM | 8 TURNS No 18 D.C.C. WIRE DOUBLE-SPACED 1½" FORM |
| 10 λ | | 3 TURNS No 22 D.C.C. WIRE DOUBLE-SPACED 1½" FORM | 4 TURNS No 18 D.C.C. WIRE DOUBLE-SPACED 1½" FORM |



¶ A Department for the amateur operator to help him keep up-to-date

is insulated from the chassis and is mounted by means of an insulated bushing.

Eight inches of the chassis' width are provided for the amplifier. This consists of the 150-microfarad tuning condenser which is mounted on stand-off insulators in the exact center of the chassis; the tube sockets, which are at the right; the tank coil, which is to the left and rear of the tubes and the neutralizing condenser for the 807s, which is mounted between the condenser and tubes.

### Small Neutralizing Capacity

Incidently, the neutralizing condenser is a cut-down midget 15-mmfd. variable condenser (Cardwell). Only a very small amount of capacity is necessary to neutralize the 807s. The grid-plate capacity is only .2 mmfd. Because of this low required capacity, it was necessary to bend both the stationary and rotor plates of the condenser so they were widely separated. Even with this small capacity condenser the plates were barely intermeshed when the amplifier was neutralized.

Jacks for meters are provided on the front panel. The one at the left is for the oscillator plate current; then in order: buffer plate current, amplifier grid current and amplifier plate current. The meters were not mounted on the panel because of

(*Turn to page* 188)

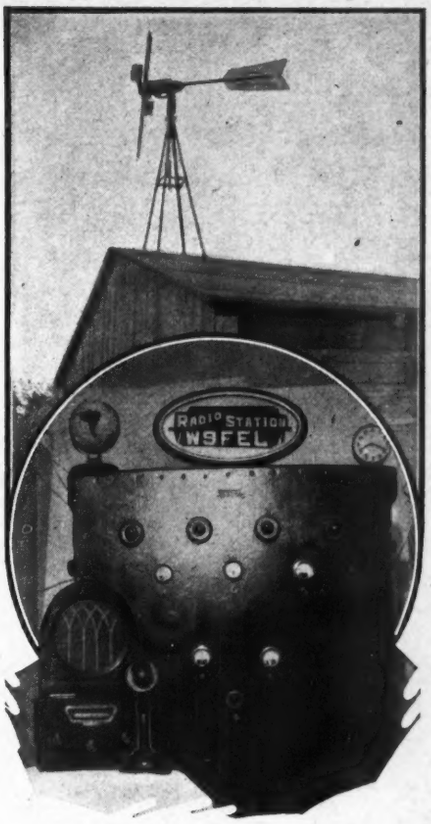
# *QSO's* Powered by *WIND*

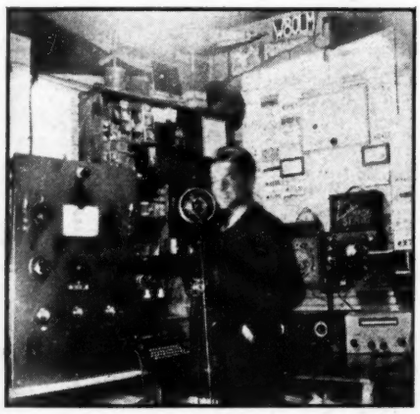
## *By* John Strong

W9FEL Glasco, Kansas, calling! Throughout each of the 48 states, as well as into the provinces of Canada and the far reaches of South Africa, Australia and New Zealand this "Ham" radio call has penetrated . . . . . powered not by the local utility company but by the wind! Charles Larson, who is also president of the North Central Kansas Night Owl Amateur Radio Club, is the operator.

Larson's rig consists of a 6L6 crystal oscillator, a 6L6 final amplifier, and 6L6 modulator. His receiver is a homemade 7-tube Superhet. All this equipment is powered by a single 6-volt Wincharger. Although the dynamotor draws from 7 to 9 amperes, the transmitter filaments 3.2 amperes, and the receiver 1.2 amps, he is also able to operate 2 large broadcast receivers, and run the electric lights in his shack on the power generated from the wind. How's that for economy?

This unusual low-powered transmitter operates on the 20, 40 and 160 meter bands. It has worked 43 states on the 160-meter band alone, and on c.w. all 48 states have been worked. In addition on c.w. it has worked all Canadian districts, Australia, New Zealand, Mexico and South Africa.



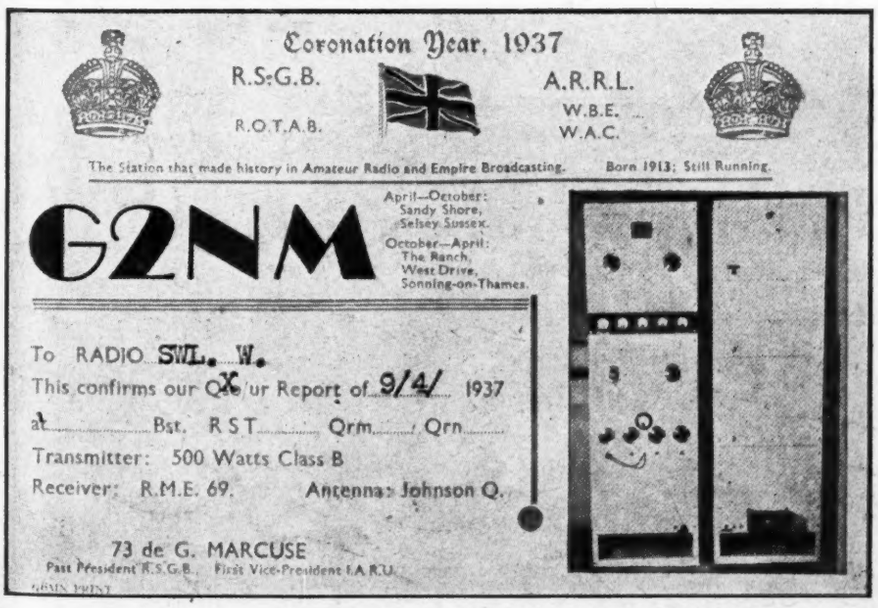



AN ACTIVE AMATEUR

*At left: Meet H. W. Dushane of Detroit, Michigan, pictured in his amateur station W8OLM. At the right his receiving position. Note the "mill" at which he is proficient and speedy.*

A CARD FROM ENGLAND

*Grace M. Beck of Chicago, Illinois, recently received the QSL card, shown below, from G2NM who operates in the summer from Sussex. The card is well laid out and prepared for this Coronation year.*




# *New* Amateur *Receiver*

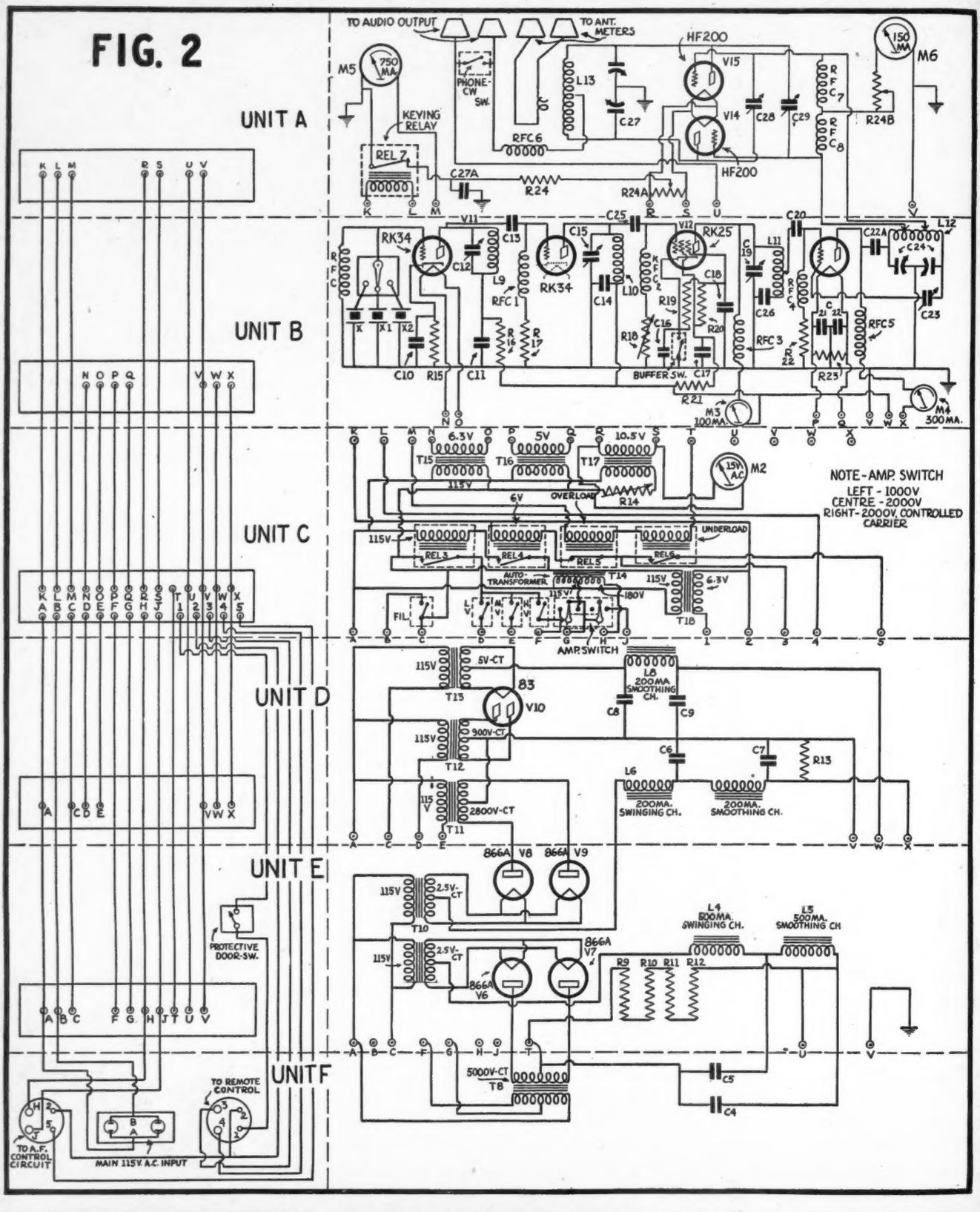
## *By* Robt. Ames

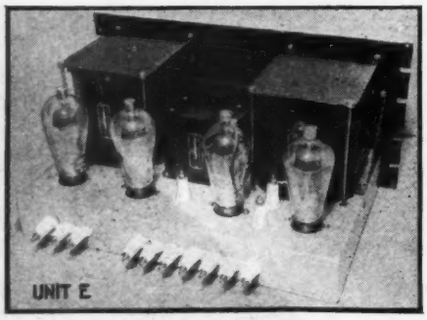
NUMEROUS commercial receivers have been introduced this year for the amateur, commercial station and short-wave listener. Receivers of 1937 contain many new electrical and mechanical features that make operating them a pleasure. Among these innovations are greater band spread, a higher degree of selectivity and sensitivity and devices for supressing noise from electrical appliances and motor car ignition.

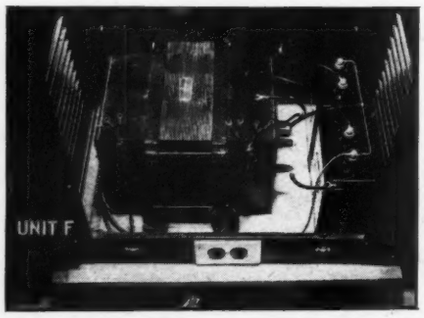
The PR-15 recently announced by the Patterson Radio Company, of Los Angeles,

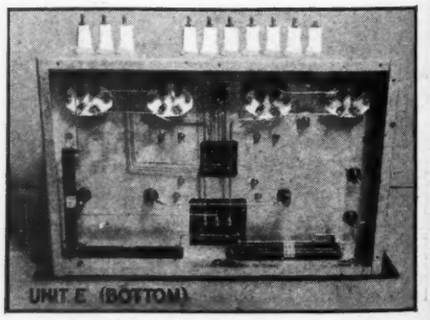
(*Turn to page* 191)

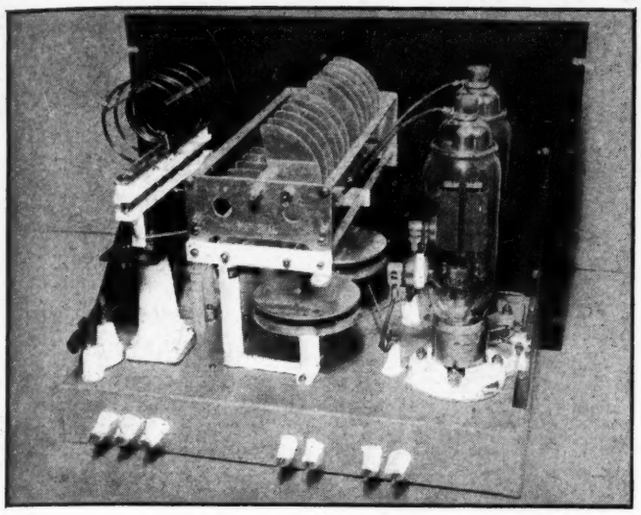
# FIG. 2

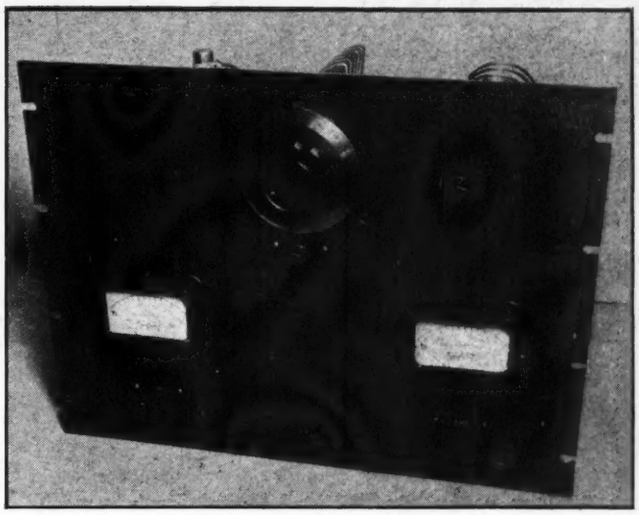

UNIT A
UNIT B
UNIT C
UNIT D
UNIT E
UNIT F
TO AUDIO OUTPUT
TO ANT. METERS
HF200
M5 750 MA.
M6 150 MA.
PHONE-CW SW.
KEYING RELAY
REL 7
RFC6
C27
L13
V15
V14
C28
C29
R24B
C27A
R24
R24A
HF200
RK34
RK25
V11
V12
C13
C15
C25
C20
C22A
C24
L12
L9
RFC 1
C14
L10
R19
R20
C18
C26
L11
C23
RFC5
RFC 3
C16
R18
C10
R15
C11
R16
R17
BUFFER SW.
C17
R21
R22
R23
M3 100MA.
M4 300MA.
6.3V
5V
10.5V
T15
T16
T17
115V
6V
OVERLOAD
R14
15V AC
M2
NOTE-AMP. SWITCH
LEFT - 1000V
CENTRE - 2000V
RIGHT - 2000V. CONTROLLED CARRIER
UNDERLOAD
REL3
REL4
REL5
REL6
AUTO-TRANSFORMER
T14
180V
6.3V
T18
FIL
AMP. SWITCH
5V-CT
T13
83
V10
L8
200MA. SMOOTHING CH.
C8
C9
900V-CT
T12
C6
C7
R13
L6
200MA. SWINGING CH.
200MA. SMOOTHING CH.
2800V-CT
T11
866A V8
866A V9
2.5V-CT
T10
L4
500MA. SWINGING CH.
L5
500MA. SMOOTHING CH
866A V7
866A V6
R9
R10
R11
R12
PROTECTIVE DOOR-SW.
5000V-CT
T8
C5
C4
TO REMOTE CONTROL
TO A.F. CONTROL CIRCUIT
MAIN 115V. A.C. INPUT


UNIT E


UNIT F


UNIT E (BOTTOM)





THE FINAL CLASS C AMPLIFIER, SHOWING REAR AND FRONT VIEWS OF UNIT A

## *Design and Construction Data on a Modern*

# X'tal-Control Transmitter

## *(The Radio-Frequency Cabinet)*

**By Willard Bohlen**
**Chester Watzel**
**L. M. Cockaday**

***(Part Two)***

THE r.f. cabinet of this "Compact Kilowatt" now in use at W2JCY is composed of six units, mounted behind six separate panels. The five upper units, A to E, are all built on 17 inches by 11 inches by 2½ inches cadmium plated chassis. These chasses are very sturdily constructed of 16-gauge steel. When mounted on their respective panels with heavy brackets they comprise a solid mechanical unit capable of supporting the heaviest of power supplies. The large power transformer, T8, is laid on the floor of the cabinet since it weighs over a hundred pounds.

The easiest method of construction is to "begin at the bottom" and mount each unit, progressively, in the cabinet on its completion. Before beginning a detailed description of each unit it might be well to look over the general scheme of interconnection of the units. A row of No. 4125 porcelain feed-through insulators is mounted across the back edge of each chassis. The relative position of each insulator is shown on the interconnection sketch at the left in Figure 2. These insulators are lined up so that all interconnecting wires may run in a vertical plane. The lettering and numbering of the insulators in the diagram correspond to that of the units at the right.

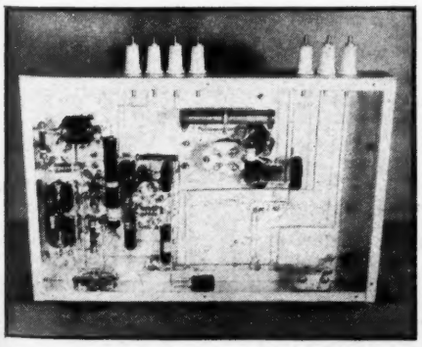
Only one departure is made from this vertical type of wiring. The lower-right insulators of Unit C (numbered 1 to 5) are connected into the more usual cable form; this cable running down the rear corner of the cabinet to the control sockets at the bottom. Although these five insulators are shown in Figure 2 as being offset from those directly above (T to X) they are actually on the same line, as the photos will show. In order that the vertical wires will not touch insulators 1 to 5, these insulators are reversed, with the short ends extending outward.

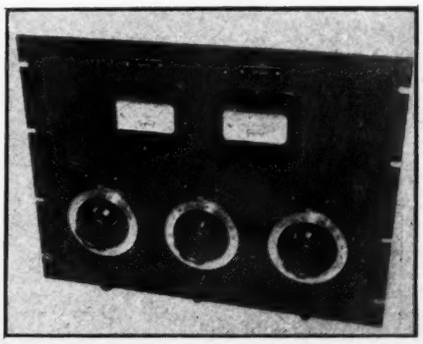
Not much more need be said about the interconnection of the chassis, the photos and diagram showing this in full. Figure 2 corresponds to the rear view of the r.f. cabinet. The socket connections at the bottom of the sketches are also shown as if from a rear view. The wiring in Unit F is done with well-insulated, rubber-covered flexible wire.

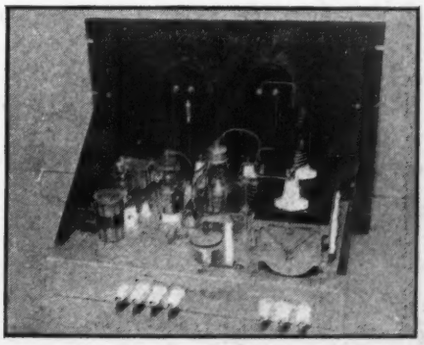
The connection insulators on all units are spaced exactly one-inch apart. This allows for fourteen vertical connection lines. Two rows of insulators are mounted on the back of control Unit C, making possible a total of 28 separate connected circuits to this unit.

Unit F should be first constructed. A sheet of ⅛ inch thick aluminum is laid in the bottom of the cabinet for additional strengthening. Before placing this sheet in place the two filter condensers, C4 and C5, should be bolted to the sheet with flathead bolts countersunk from the bottom.

Power transformer T8 is not bolted down. Its weight, being over 100 pounds, serves to keep not only itself but the

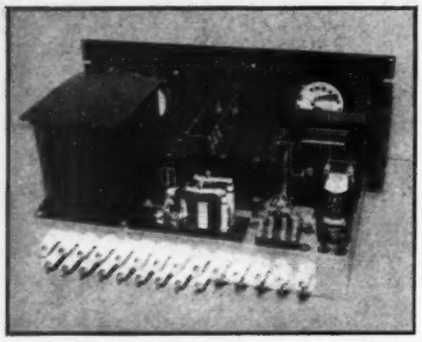


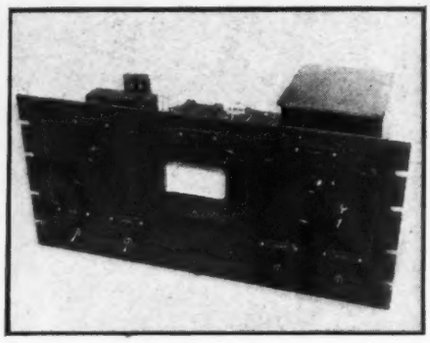


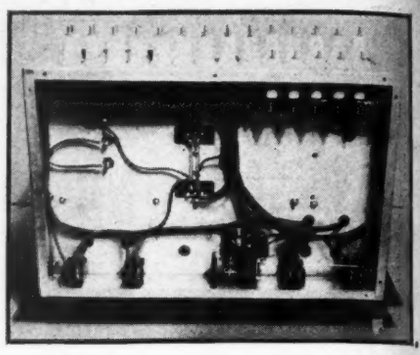


THE R.F. EXCITER

*Center: Front view of the crystal exciter and driver. At left and right: The bottom and rear views of same unit.*







THE CONTROL UNIT

*Center: Panel view of Unit C. At left and right are the rear and bottom views of same Unit.*

aluminum sheet in place. This not only simplifies construction but eliminates any protruding boltheads from the bottom of the cabinet, leaving a smooth bottom surface that may be slid on a smooth floor. A blank panel, 7 inches in height, is used for Unit M. A blank receptable plate is fastened over the center cut-out at the front-bottom of the cabinet and painted with Na-ald black crackle paint. The two round knockouts on the front bottom are left untouched.

## "Bleeders" Used

At the rear bottom of the cabinet the center cutout holds a dual a.c. receptacle, with corresponding faceplate. The two knock-outs on either side, although intended to take BX cable, luckily are of the correct diameter to mount ordinary Hammerlund isolantite tube-type sockets. A pair of these 4-prong isolantite sockets are used here to take the two control cables.

Unit E is next in the order of construction. This holds the rectifiers, filter chokes, bleeder, and rectifier filament transformer for the 2000-volt power supply. The bleeder is made up of four separate small resistors, for convenience in mounting, and placed under the chassis. An extra pair of 866-A rectifiers and the filament transformer are also mounted on this unit. These are for the 1200-volt supply, the remaining components for this supply being mounted on Unit D, directly above. The compactness of the entire transmitter makes this division of parts necessary in order to accommodate all the components.

## High-Voltage Leads

Several leads run between Units D and E and between E and F which are carried directly between the units without coming out to the back edge of the chassis. The two leads from the high-voltage sides of C4 and C5 are soldered directly to the lugs of L4 and L5, which extend down through the chassis, while a pair of No. 4125 feed-through insulators, mounted on top of the chassis, bring the high-voltage connections of power transformer T8 up to the plates of V6 and V7. Similarly, the high-voltage connections of T11, on Unit D, drop to the plate caps of V8 and V9.

Unit D is quite conventional in lay-out, except that the rectifiers V8 and V9 and their filament transformer T10 are mounted down on Unit E. Two separate power supplies are built on Unit D, these being the 1200-volt supply for the RK-38 and the 450-volt supply for the RK-34 and the RK-25. A bleeder, R13, is used on the 1200-volt supply and is mounted under the chassis. No bleeder is used on the 450-volt supply, as the RK-34 runs continuously and will drain off any charge after this supply is turned "off."

## For Safety Control

Control Unit C. is next in order. The functions of this unit require a good bit more explanation than the simple power-supply units below. The upper row of transformers in the diagram of Unit C (Figure 2) supply the filaments of all the r.f. tubes. T15 supplies 6.3 volts to the RK-34 and RK-25, T16 five volts to the RK-38 while T17 provides 10.5 volts for the filaments of the HF-200's in the final stage. A voltmeter, M2, checks the filament voltage on the HF-200's, this voltage being adjusted with R14.

The five switches across the bottom of the diagram of Unit C control the several power supplies from the panel. The one at the left controls not only the filament transformers but the "entire works" including the plate transformers and the relay circuit transformer, T18. This eliminates the possibility of applying plate voltage to any tubes without their filaments being lit. The other three toggle switches control the three power supplies, the "LV," "MV" and "HV" referring, respectively, to the 450, 1200 and 2000-volt supplies.

## Reducing Power

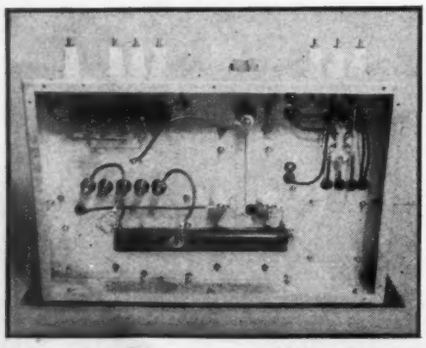
The remaining switch, marked "amp. sw." on the diagram, is an additional switch controlling the 2000-volt power supply. This is a 2-gang multi-point switch. Three pairs of contacts are used, every other pair between skipped because the use of adjacent contacts on this type of switch would mean short-circuiting of the 110-volt line, when turning the switch. When in the left-hand position, the full primary of T8 is utilized. As this full primary is for 230 volts, the application of only 115 volts to the full primary will result in dropping the secondary voltage to half value. This reduces the plate voltage on the HF-200's to 1000 volts. This reduction is useful for tuning-up purposes.

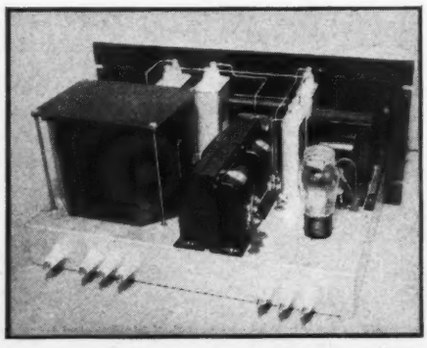
## Controlled Carrier

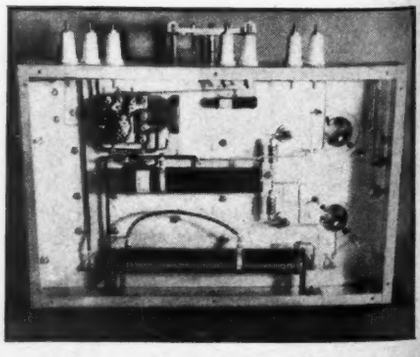
When this switch is turned to the center position the regular 115-volt tap (half the full winding) is used, raising the voltage to a full 2000. Turning the switch all the way to the right-hand position leaves the same primary section of T8 connected as in the center switch position but cuts the two controlled-carrier transformers, T6 and T14, into circuit. T6, which will be shown in Figure 3 next month, is the controlled-carrier variactor, and is located on Unit H in the a.f. cabinet. The variation in plate current of the 822 modulator tubes during modulation (*Turn to page* 178)

LOW VOLTAGE RECTIFIER

*Center: Rear view of Unit D which contains the 450-volt and the 1200-volt power supplies. At left is the bottom view of this Unit. At right: The bottom view of the final Class C amplifier (other photos at top of preceding page).*







# *Improving* HEAD-PHONE Reception *with an Acoustical Labyrinth*

**By N. P. R. Jarnak**

EXPLAINING THE ACOUSTICAL PROBLEM

*The inventor, center, explains the operation of the acoustical labyrinth in the earcap, while S. Gordon Taylor, left, and the editor, right, witness a demonstration. The earcap has been attached to a phone through which Mr. Taylor is listening.*

**PROBABLY millions of enthusiastic radio fans still have a pair of old headphones hanging around somewhere, out of use, of course, but reminding about the time when crystal sets were in use and the telephone receiver was the only means whereby long-distance radio could be received.**

SINCE early radio days the radioman has found the need of headsets for communication purposes. The situation of today is, however, that besides the amateur and short-wave listener to whom the headphone always has been popular, radio listeners in general see new reasons for listening in this way. It might be wise, therefore, if manufacturers made provision in new model receivers for plugging in headphones.

Headphones provide "bedside radio" without disturbing others, and the hard-of-hearing too will find great pleasure in countless interesting radio programs that they have missed in the past. If at the same time, the reproduction of speech and music from headphones could be improved this would again add to headphones popularity.

## A Difficult Problem

The sound from the telephone receiver is produced by the motion of a vibrating elastic diaphragm, which motion is supposed to follow exactly the strength of the electro-magnetic flux built up by the impressed electric speech-current through the winding, thereby converting the electrical vibrations into similar mechanical sound vibrations. It has been a difficult problem to accomplish this without some kind of distortion, due to the resonance vibrations built up in the diaphragm. The ear finds this distortion annoying as it hears the added mechanical vibrations masking the clearness of speech and mellowness of music.

## The New Idea

Concerning the quantitative distortion related to the vibrations of the diaphragm, very little has been published. In general the character of this distortion is divided into two groups, namely, amplitude and frequency distortion. But beyond some arrangements (using damping by air or other elastic material) no means seems to have been employed for decreasing this undesirable effect. It must be admitted that the acoustical features of the earcap of today are still about as Alexander Graham Bell left it.

From experiments concerning the resonating body of violins and organ pipes, I arrived, recently, at the idea of clearing up the response of a telephone by employing a properly-constructed resonator associated with the vibrating diaphragm. This idea was worked out producing the design of the earcap as shown in Figure 1. It is based on the principle of producing interfering standing waves in the proportion 2:3.

The resonating body loading the diaphragm consists of (*Turn to page* 185)

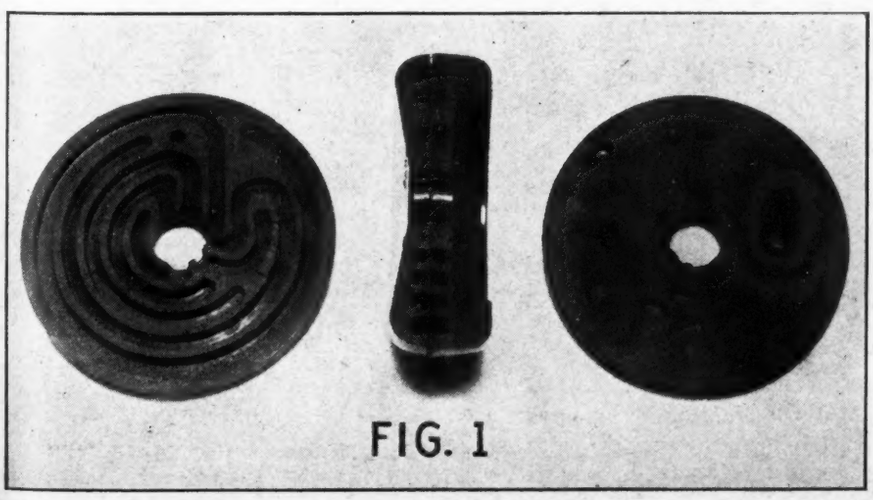


FIG. 1

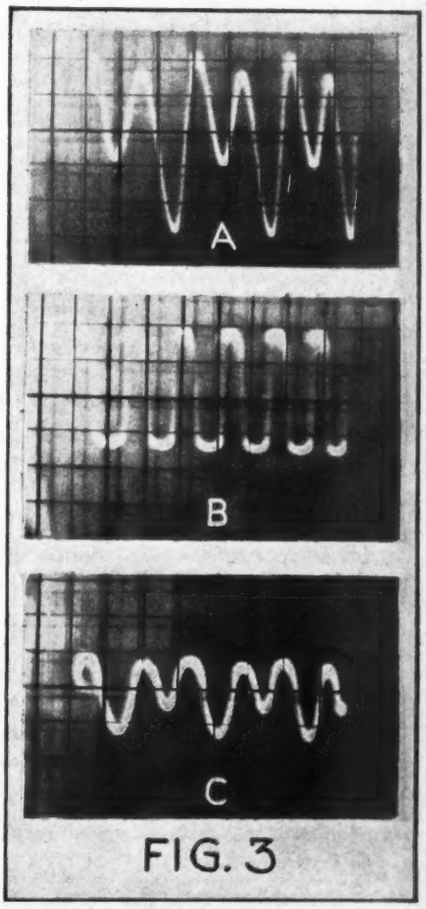
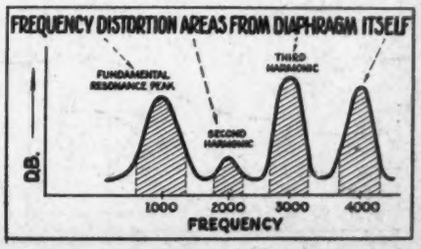
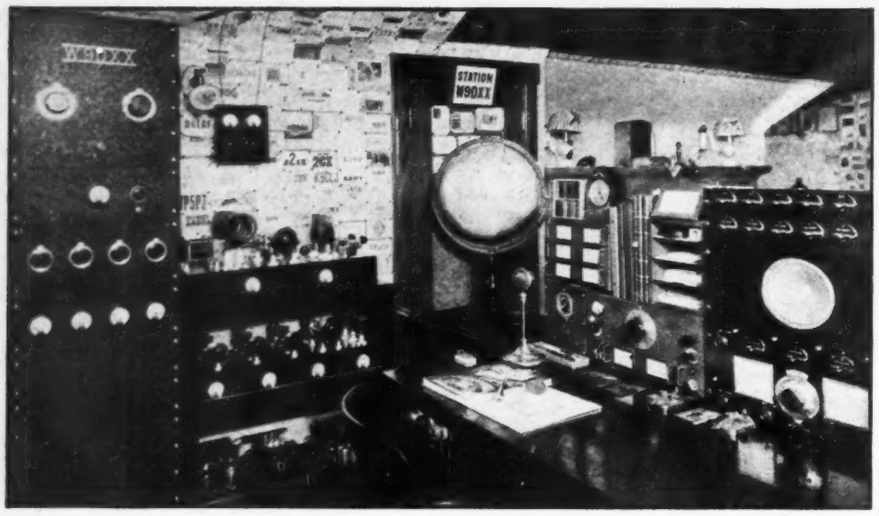



FIG. 3

DIAPHRAGM RESONANCE

*Figure 2. The curves below show the diaphragm resonance curves, with harmonic areas in which distortion occurs.*






A YL's STATION

*Amateur stations are not necessarily limited to ownership by the male of the species. Here is a decidedly FB station, W9DXX, owned and operated by Mrs. Alice R. Bourke, Chicago.*

# THE AMATEUR OBSERVER

## *By* W2JCR

**WE herewith present a new department to be devoted to the interests of those, whether they be licensed "Hams" or SWL's, who regularly listen in on the Amateur Bands. It will be the primary purpose of this department to present Lists of Amateur Calls Heard, thus providing useful information to Amateurs who are desirous of knowing where their stations are being heard, and enabling Short-Wave Listeners to know what is being heard.**

AS in the cases of the S. W. and Broadcast-Band DX Corners, Official Observers will be appointed as applications are received and approved. A cordial invitation is hereby extended to all those interested, to send in their applications. The only requirements are that applicants listen regularly on any or all of the amateur bands, that they be sufficiently well equipped to be able to hear DX, and that they be willing to submit monthly reports of stations heard. It is suggested that the application be accompanied by a report showing stations heard during the last month.

It will help this department tremendously if stations included in reports are listed in an orderly manner, grouping stations for each district or country together and listing each band separately. Below is a model report from W2JCY showing the recommended form. Note that this report includes "R" reports on stations heard. This is an excellent idea as it is helpful to everyone concerned to know just how well you are hearing the stations you report.

Those appointed as Official Observers will be awarded Certificates, 8½ by 11 inches in size and suitable for framing, proclaiming to the world in general that the holder is an Official RADIO NEWS Listening Post Observer for the Amateur Bands.

### A Model Report

The following report is shown complete to demonstrate the orderly form used by W2JCY, and to serve as a suggestion for others in preparing their reports:

**Heard During June at W2JCY, North Pelham, N. Y.**

*5-Meter Band*

| | | | | | |
|---|---|---|---|---|---|
| **W1AVV - R9** | | EYM | 8 | GLF | 8 |
| FHN | 9 | DBM | 9 | AFJ | 7 |
| BCR | 8 | BAO | 9 | EUY | 7 |
| GDJ | 7 | FLQ | 6 | FSI | 7 |
| GUY | 6 | MY | 4 | DPC | 8 |
| EER | 9 | HDQ | 5 | CUD | 7 |
| JRV | 9 | HRZ | 6 | GMY | 4 |
| BRL | 7-8 | **W2CLD** | 9 | EET | 7 |
| CEL | 6 | HWX | 9 | DZD | 7 |
| COO | 4 | HHN | 8 | FQS | 6 |
| JQJ | 5 | IKD | 8 | ETU | 8 |
| IYS | 7 | FGB | 9 | GQS | 7 |
| IKB | 9 | ST | 9 | GYJ | 7 |
| JPM | 5 | CAH | 6 | GQG | 8 |
| SS | 5 | AHX | 8 | FDI | 8 |
| JQA | 6 | GPS | 8 | DOD | 6 |
| CDR | 8 | JJX | 7 | BZJ | 9 |
| ABO | 9 | KAX | 5 | FPU? | 6 |
| KQK | 7 | JKL | 7 | **W8NSS** | 4 |
| JMI | 6 | ACR | 4 | QMF | 5 |
| IZE | 9 | AWR | 9 | QWW | 7 |
| IDA | 4 | JNN | 9 | BIQ? | 4 |
| JNV | 5 | **W3GQX** | 8 | **W9UAQ** | 9 |
| KPW | 6 | AXR | 9 | NRT | 7 |
| KBT | 3 | FVR | 7 | FPI? | 8 |
| FKV | 4 | EJT | 9 | TXS | 6 |
| KEG | 7 | BFB | 9 | ZPD? | 5 |
| IJ | 9 | DRP | 2 | | |

*10-Meter Band*

| | | | | | |
|---|---|---|---|---|---|
| **W1HRX - R6** | | EDD | 9 | CGY | 7 |
| IYE | 7 | EJQ | 7 | ITH | 9 |
| KPP | 8 | BVY | 9 | GCX | 9 |
| IJK | 8 | DXM | 8 | CKR | 8 |
| CJH | 7 | EMN | 6 | MDN | 7 |
| **W3GYD** | 4 | EQN | 7 | MMW | 8 |
| GIZ | 7 | AP | 9 | **W8JOQ** | 6 |
| AIR | 3 | BQI | 6 | PZD | 6 |
| **W4CYV** | 6 | EGJ-R | 8 | CHB | 9 |
| DEK | 8 | DAY | 7 | QMF | 8 |
| EEV | 8 | CYU | 9 | **W9TII-R** | 9 |
| PD | 9 | BEN | 6 | CCI | 7 |
| EAX | 6 | **W5DRF** | 8 | OFL | 8 |
| DKZ | 7 | COJ | 7 | AGS | 7 |
| ERH | 9 | COV | 7 | SQE | 7 |
| DON | 6 | GAR | 9 | IJX | 8 |
| EGH | 7 | EME | 7 | USU | 7 |
| EDQ | 8 | FDE | 6 | LXX | 7 |
| CRA | 9 | **W6LBX** | 7 | CNE | 7 |
| ETF | 7 | LFU | 7 | HDZ | 7 |
| CUS | 9 | MWK | 7 | HEM | 7 |
| DUK | 7 | NAP | 8 | PEI | 9 |

### DX Corner-Broadcast Waves

THE DX Corner for Broadcast Waves is being omitted this month and next due to the limited interest of readers in DX activities during mid-summer. The department will be resumed in the November issue.

| | | | | | |
|---|---|---|---|---|---|
| PQH | 6 | WIJ | 7 | HI7G | 8 |
| BBN | 8 | TTB | 7 | LU5FG-R | 7 |
| VHQ | 8 | VQM | 8 | K4EJF | 8 |
| MCD | 7 | PEQ | 9 | K5AT | 7 |
| WOV | 8 | | | VK2GU | 7 |
| DTP | 8 | **FOREIGN** | | VK | |
| VPG | 7 | | | ZL2FY | 6 |
| ULJ | 7 | K6MVV | 8 | PY3AB? | 8 |

## CALLS HEARD

BY George Hare, Station Road, Leadenham, Lincolnshire, England, on 20 meter 'phone: W1ADM, W1IFD, W1WJ, W1JZA, W1AIQ, W1GED, W1QM, W1CND, W1COJ, W1COO, W1KKT, W2ZC, W2GMY, W2IHW, W2BYM, W2GIZ, W2CWC, W2HS, W2IDQ, W2JKQ, W3BSY, W3FAO, W3EOZ, W3BML, W3CUB, W3FIH, W3DPC, W3EMM, W4AH, W4AIJ, W4EGN, W4EM, W4NN, W6FGU, W6AMG, W6MWC, W6EJC, W8NYP, W8CUO, W8MRR, W8MDU, W8GLC, W9NLP, W9TVZ, W9CVN, W9ELL, VE1AW, VE1BR, VE1JA, VE2DC, VE2MC, VE3AGT, CO2HY, CO7HF, COCX, CO8BZ, COOG, CE1AO, YV5AK, LU4BL, VO1P, 2Z, SM5WJ, 7WR, G6XR, G8BD, FT4AA, AG, AI, CN8AA, CT1AY, CV, OR, 2AB, PY1DK, 2BA, ET, F3GS, 8QD, MG, PU, I1SR, 2PF, HA1M, 8N, NY2AE, SV1NK, LA1G, SU1CH, SG, KG, RO, TN, 5NK.

By R. T. Coales, 54 Chelsea Road, Southsea, England, on 10 meter 'phone: VE1DT, YL2BB, YL2CD, W1BQQ, W1COO, W1DQK, W1HLH, W1KFC, W1TW, W2DKJ, W2JRR, W5FDI, W8GLY, W9BBU, W9RRX.

On 20 meter 'phone: W1DAY, W1CHG, W1AJZ, W1IFD, W1HPV, W1WJ, W2IXY, W2HS, W2JHS, W2OJ, W2CWC, W2HFS, W2IDQ, W2BTP, W2MJ, W2AIO, W3MD, W3GFH, W3DLL, W3ANH, W3ASG, W4AGB, W4AH, W4CPG, W4CDY, W4AXZ, W5FRM, W5BMM, W5FGP, W6BAY, W6AM, W6GRL, W6BGH, W6AH, W8MRR, W8KBJ, W8ANF, W9ALA, W9FCY, W9MCB, W9FSY, W9ANR, W9QI, W9YGC, W9ELL, W9ARA, W9LXK, VE1CR, VE2DC, CO6OM, HK3JA, FT4AA, I1SR, OE3AH, SM7YA, YR5AA, G2NM, G5XN, G6DT, G5TZ, G8BD.

By R. J. Abbott, Penrith, Column Lane, Blalry, Leicester, England, on 20 meter 'phone: VE1BR, VE1CR, W3F1U, CT1AY, W4DLH, W1BLO, SM1KG, WE1CK, W3FIH, W3BFH, VE3ACK, HI7G, VP9R, WZIXY, SV1NK, W8MRR, SU1CH, W8DLY, CE1AO, PY2EJ, VE2DC, FT4AG, W2FPB, W1AJZ, W3LP, W3DPC, W1NW, VE1DR, W9KG, WZZC, VE1CM, W2ZC, W4GCQ, VK2XU, W6CQI, SM6ML, W6AH, W2FCB, W1ADM, W2FCB, W2MJ, W4HX, SM7YA, W1CRW, W3FPU, W2GKO, VO1P, SM5SV, VU2CO, SU1SG, HC1JW, I1IP, W9UVC, W9QI, ZD1H, W1AVG, W4AH, SV1KE, SV1CA.

By Rodney Newkirk, 1517 Fargo Avenue, Chicago, Ill., on 20 meter 'phone and C.W.: W1OXDA, K7FRU, K7FYI, FA8DA, VP2CD, LU2AJ, LU4BH, LU4BL, LU5AN, LU6DG, LU6JB, LU7AC, LU8AB, LU8AD, VK2AB, VK2ACC, VK2ADE, VK2CI, VK2DG, VK2DK, VK2ED, VK2HF, VK2HI, VK2HV, VK2IC, VK2IM, VK2JO, VK2LD, VK2LP, VK2LX, VK2NO, VK2NQ, VK2OQ, VK2PX, VK2QL, VK2QY, VK2RX, VK2TI, VK2TT, VK2UN, VK2UY, VK2VL, VK2WW, VK2XJ, VK2XQ, VK2YY, VK2ZX, VK2ZZ, VK3EH, VK3EO, VK3HK, VK3IX, VK3KT, VK3KX, VK3NG, VK3NM, VK3OC, VK3OM, VK3UJ, VK3VF, VK3WP, VK3XQ, VK3ZP, VK4BK, VK4CG, VK4EL, VK4HR, VK4JU, VK4LW, VK4RF, VK4RT, VK4SD, VK4WT, VK5HG, VK5JB, VK5JS, VK5LR, VK5WK, VK5WR, VK5ZX, VK6SA, VK7KV, OE3AH, ON4AA, ON4FEC, ON4FQ, CP3ANE, PY1AZ, PY1DH, PY1FR, PY2BU, PY2BX, PY2CW, PY2DN, PY2HM, PY2LJ, PY2KD, PY3BX, PY3ZK, PY5AK, PY5AQ, PY5QG, PY8AD, PY8AH, VP1WB, K5AC, K5AF, K5AG, K5AJ, K5AM, K5AY, NY1AA, NY1AD, NY1AE, NY2AE, VS7RF, CE1AH, CE1AO, CE3AR, CE1AR, TI2KP, CM2AD, CM2AF, CM2AO, CM2BC, CM2BG, CM2EA, CM2FM, CM2OP, CM2RZ, CM2ZG, CM6AJ, CM7AB, CM7AE, CM7AI, CM8JR, CM8MC, CO2AG, CO2BY, CO2CC, CO2EO, CO2HY, CO2JG, CO2JJ, CO2LG, CO2LY, CO2MT, CO2RH, CO2RR, CO2RW, CO6OM, CO7AS, CO7CX, CO7VP, CO8AE, CO8JK, CO8EC, OK1BZ, OZ7CC, F3AD, F3AK, F3AM, F3KH, F8BF, F8FH, F8GQ, F8KE, F8PZ, F8ZU, D3GKR, D3FZI, G2DH, G2FH, G2PL, G2QN, G2TR, G2WP, G2YK, G5QA, G5SU, G5WP, G6FQ, G6LV, G6RB, G6VP, G8IL, K6FKB, TG1AX, K6BAZ, K6BHL, K6BNR, K6BUX, K6ILT, K6KKP, K6LRB, K6MVV, K6NJV, K6NXB, K6NXD, K6OAR, K6OEP, K6OES, K6OLX, HR2A, I1IR, VP5PZ,

(*Turn to page* 186)

*New "Amateur" Type*

# 16-TUBE Superhet

## *(RCA Model ACR-111)*

**By Everett M. Walker**

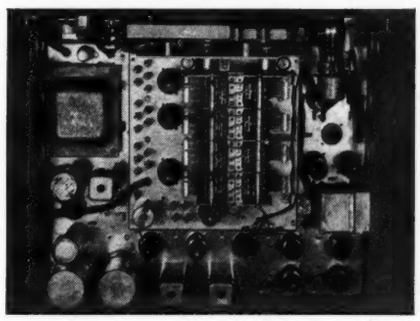
UNDER TEST AT W2MW

*The author put this new receiver through its paces at his home station and in this article describes both the receiver and the test results.*

A RECEIVER designed to meet present-day conditions of crowded bands, man-made noise and multi-band operation recently was announced by RCA as their Model ACR-111, the circuit of which is presented below. It is a 16-tube superheterodyne which covers a frequency range of 540 to 30,000 kilocycles in five bands. In addition to two stages of radio-frequency amplification ahead of the mixer, a number of gadgets and devices are incorporated in its design to assure comfortable operating results under the most trying conditions. Principal among these features are a built-in noise suppressor and crystal filter circuit. Other features of the ACR-111 include electrical band spread, noise limiter, sensitivity and automatic volume controls for both c.w. and 'phone reception, and a stand-by switch with a pilot light to indicate the operating position of the receiver.

The receiver is mounted in a crackle dark gray cabinet, 21 inches long, 13 inches high and 16 inches deep. The loudspeaker is external and of the dynamic variety with a cable connection for providing both input and field current.

All of the controls are contained on the front panel, conveniently arranged and clearly labeled. These include the tuning and band-spread dials which are two large knobs to the right and left of the tuning dial window. The dial itself is composed of two units; one indicating the band, which is calibrated in kilocycles and megacycles and the other for the band-spread control. The main tuning control which is at the right controls the four section main ganged condenser. The one at the left controls the band-spread capacitator.

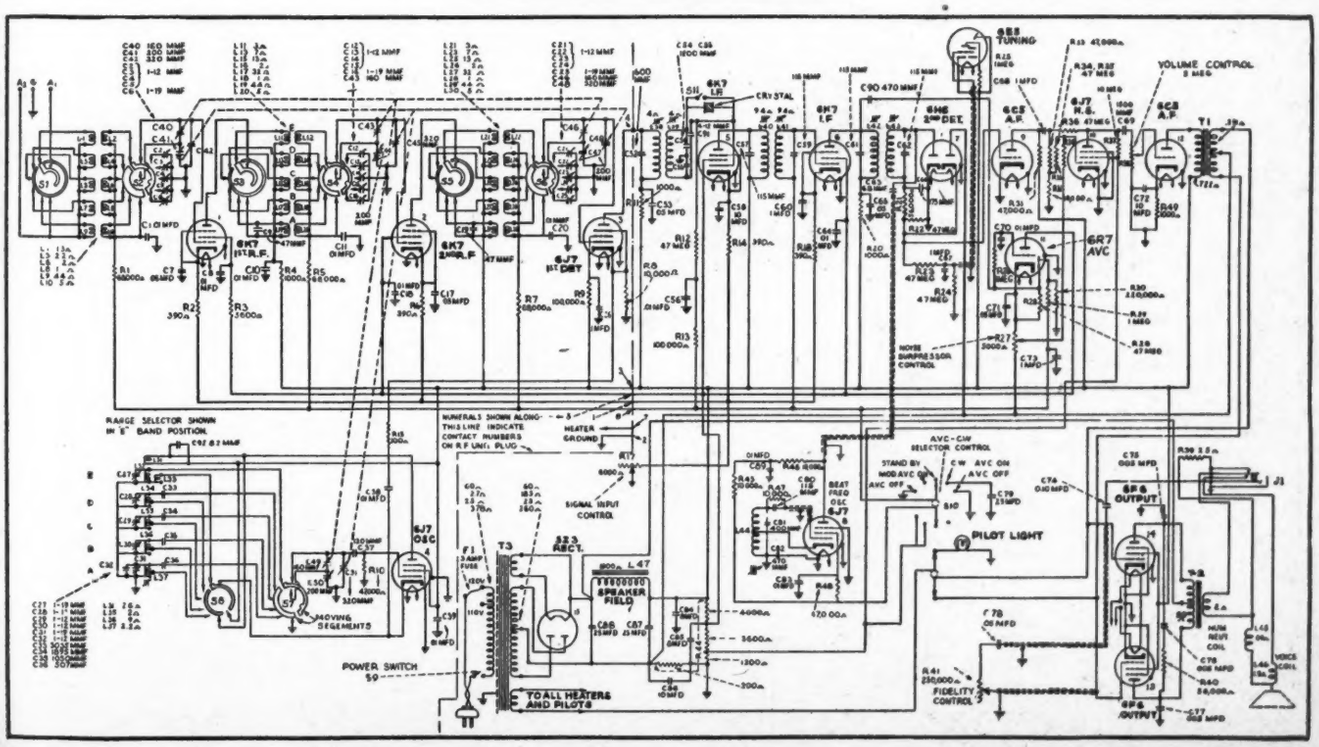


THE CHASSIS

*Left: A ship-shape job with built-in power supply, but external speaker. It is suitable for cabinet or rack mounting.*

Other controls are: volume-control knob; power and fidelity control, which turns on the power and serves as a tone control; range selector, which selects any one of the five ranges and automatically brings the required scale into the dial opening; electron-ray-tuning tube; selectivity control, which introduces the crystal filter for single-signal reception and phasing; beat-frequency pitch control; signal input (sensitivity) control; a.v.c.-c.w. selector switch, which also serves as a stand-by switch; noise suppressor control and 'phone jack for head-receiver operation.

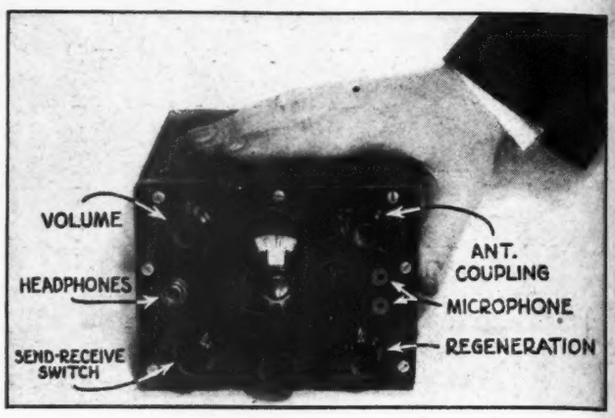
The ranges covered are: 540 to 1600 kilocycles, 1600 to 4000 kilocycles, 3000 to 8000 kilocycles, (*Turn to page* 184)



# The "TINY TOT"

## (5-Meter "Super-regen")

**By A. J. Haynes (W2JHV)**




JUST A HANDFUL—BUT "PEPPY"!

*A complete 3-tube receiver capable of full loudspeaker output. In addition its front panel carries microphone connections, microphone voltage supply and "send-receive" switch for remotely controlling a transmitter where both use the same power supply in portable-mobile service.*

**ALTHOUGH tiny in size, this receiver will give results equal to the best of larger super-regens, either for home or portable use. Its radiation is negligible and it operates from any power supply unit capable of supplying 250-300 volts d.c. and 6 volts a.c. or d.c. for the filaments.**

THE receiver described in this article was designed for use in a portable-mobile rig in which the receiver is installed in the glove compartment on the dash of the car and the transmitter, with one of the new Mallory "Vibrapak" power supplies, in the trunk. The receiving antenna is mounted on the side of the cowl and the transmitting antenna on the side of the trunk (or rear bumper) to keep the transmission lines short and thus minimize losses. The microphone connections and microphone voltage supply are in the receiver, as is the "send-receive" switch, so that all operating controls, except the switch which turns on the power supply and transmitter filaments, are on the receiver panel. The transmitter is now under construction and is scheduled for completion and test in time to present a constructional description next month.

In designing a receiver for 5-meter portable-mobile work the only real problem that presents itself is mechanical layout and construction. It must be compact and adaptable. So far as the circuit is concerned, super-regeneration is certainly indicated; for with the new tubes, now available, combined with the several years' experience we have had in adapting this circuit to 5-meter reception, we can put together a receiver of this type which even when used at the home QRA will give a superhet a good run for its money. As long as we leave sufficient room around our tuning inductance, compact construction is a benefit rather than a hindrance as it allows our leads to be reduced to a minimum.

### Three Octal Tubes

While the design of the 5-meter receiver presented herewith is a bit radical in some respects, it is simple of construction and lends itself admirably to either portable mobile or fixed station operation. The control panel is 4⅝ inches high by 6 inches wide. The overall size of its cabinet is $4\frac{11}{16}$ inches high by 6⅛ inches wide by 6⅞ inches deep; small enough to slip into most any automobile glove compartment and leave room for mike, phones, etc.

The self-quenching ultra-audion circuit with two stages of audio amplification is used with three octal base tubes. The detector is a 6J5G which, with its small, closely spaced elements and surprisingly large mutual conductance, is a remarkably fine high-frequency detector.

The first stage of audio uses a 6L5G. Its heater draws only .15 amp. and yet its characteristics are superior to the old 76. The output tube is a 6K6G, being our old friend the 41 with an octal base and still drawing .4 amp. heater current with a 3½ watt output or the beam-power 6V6 may be used here and will provide greater power sensitivity. As the 6J5G draws .3 amp. our total filament current is only .85 amp. which will help hold down the voltage drop in the cable from the storage battery.

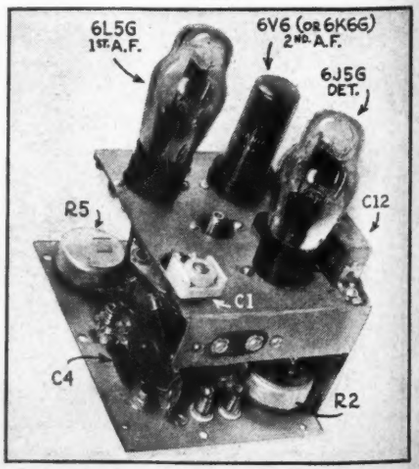
### Simple to Build

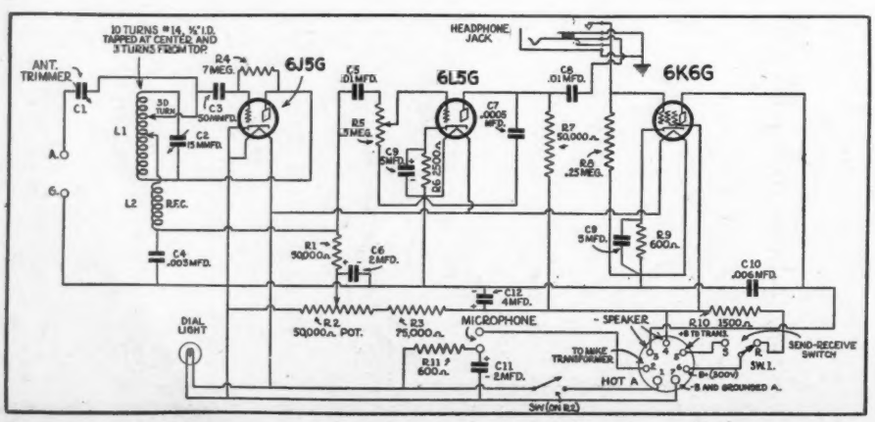
A little more power can be obtained from the amplifier with an increase of only .2 amperes in filament current by using another 6J5G for the first stage and a 6V6 beam power tube in the output. This tube line-up gives greater power sensitivity with an available output of over 4 watts. If the above tubes are used no changes will be necessary except for the cathode resistor for the output tube which should be changed from 600 to 300 ohms.

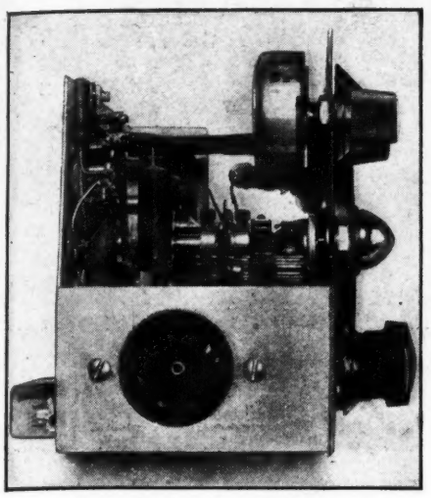
The details of the circuit are given in the schematic diagram, Figure 1, and the proper wiring will be quite obvious as the layout is so compact that the condenser and resistor leads

THE TUBE PANEL

*The screw terminals on the flange are for antenna connections, reached through corresponding hole in cabinet wall.*





VIEW FROM THE LEFT

*The chassis and panel are formed from one piece of metal as shown in Figure 2. The cable-plug socket in the foreground carries all connections for interconnecting the power supply, receiver, loudspeaker and transmitter.*

form most of it. Keep wires away from the oscillating circuit, particularly the grid leak and condenser. The detector tube is by itself on one side of the chassis; the amplifier, connection plug, etc., on the other side.

No attempt was made to include the speaker in the set as this is something which can be tucked away in an odd corner of the car or placed under the dash. One of the small PM variety should be used and the 6-inch size is suggested as being a decided improvement over the 5-inch and taking up very little more room. It will handle considerably more power than the former with excellent speech quality.

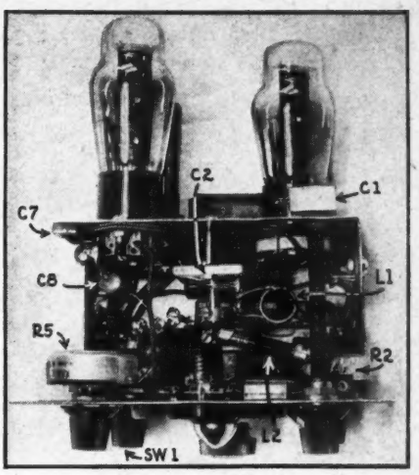
With any directly connected super-regenerative receiver there is always the problem of radiation interference and of course it cannot be entirely eliminated. It *can*, however, be minimized by good circuit design and wiring and the choice of the proper detector. When these points have been properly considered we have a circuit with a very low time factor combined with a tube having high mutual conductance, which results in smooth, uniform super-regeneration at a surprisingly low plate voltage. Such a combination also gives maximum sensitivity and selectivity.

## Minimum Radiation

Voltage measurements made on this receiver under actual operating conditions, using a zero current voltmeter to obtain true readings, showed 12 volts across the detector plate and filament when tight coupling to the point of maximum sensitivity was used and only *5* volts when fairly loosely coupled to the antenna. Incidentally, this latter coupling was still tight enough to prevent some super-regenerators the writer has built, using less efficient tubes and circuit layout, from operating at all. The sensitivity at the 5-volt adjustment was only slightly below maximum; the normal operating point varies between these two extremes.

## Adjustable Tone

The shunting condenser, from plate to ground of the output tube, can be varied from .002 to .006 mf. to give the best tone for speech reproduction




TOP VIEW

*Most of the wiring is complete before the tuning condenser, coil and the insulated shaft of C1 are mounted. This arrangement of chassis and parts results in extremely short leads throughout.*

with the particular speaker being used; and use a good mica condenser. The use of modern, physically small condensers throughout is advisable; not only for the sake of space but because their capacity fields to ground and other parts of the wiring is less.

This receiver may, of course, be used with any form of high-voltage supply and either a.c. or d.c. filament voltage. However, it was designed specifically for a 300-volt, 100-milliampere vibrator power supply. In case B batteries or lower-voltage plate supply is used the (*Turn to page* 183)

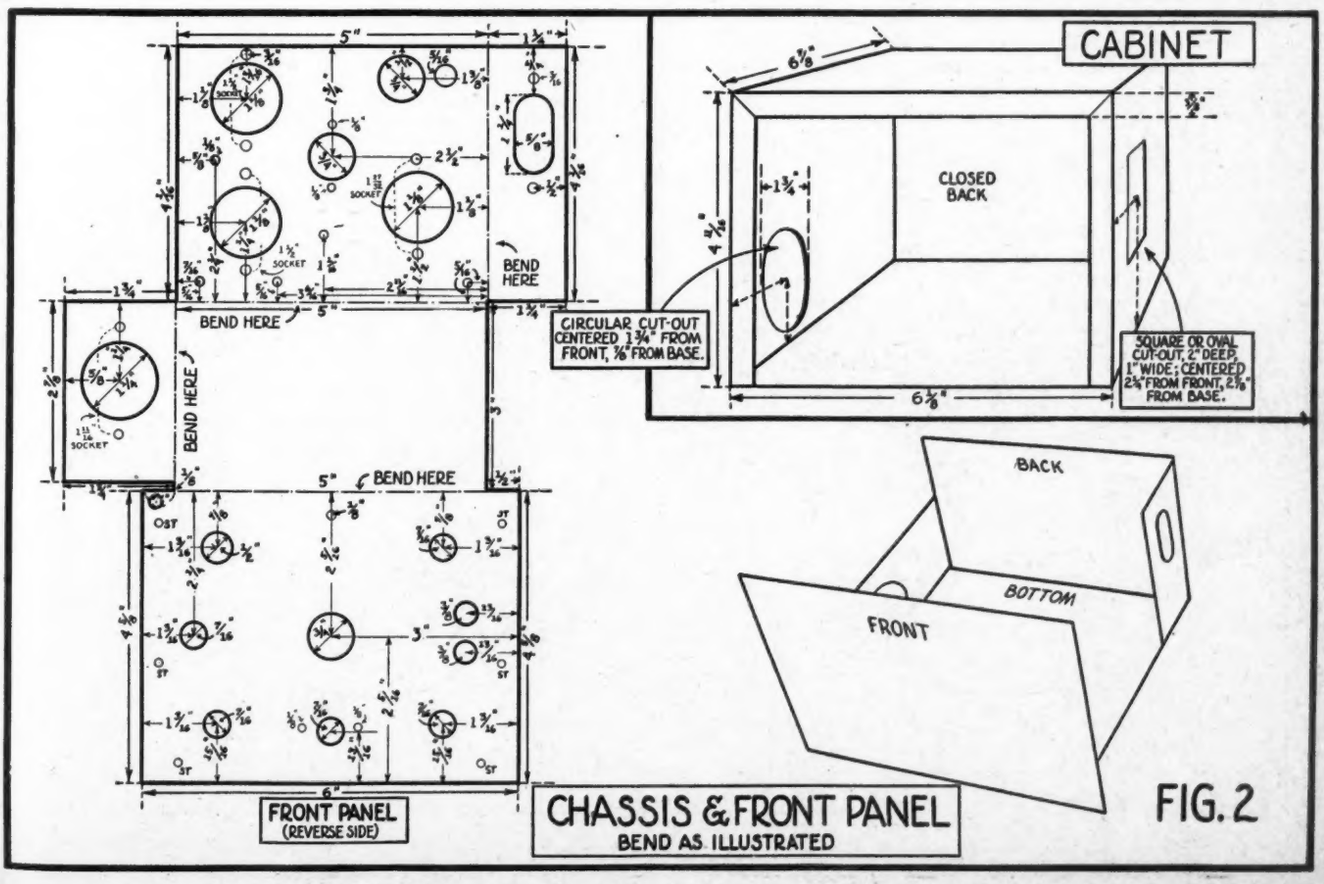
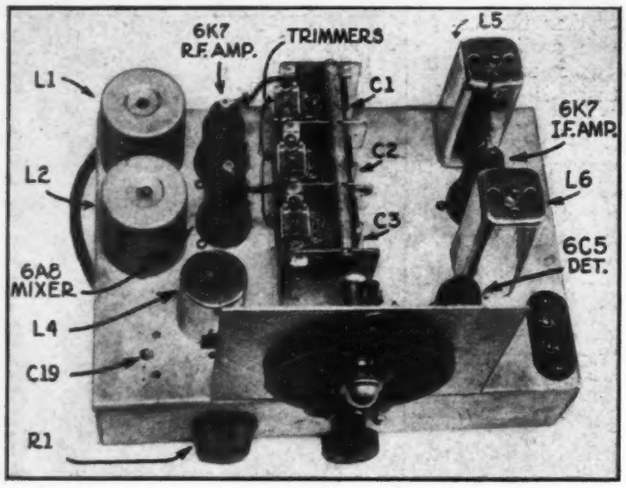



FIG. 2




THE COMPLETED TUNER

*This is an excellent little tuner, providing good quality with sensitivity and selectivity more than adequate for all normal requirements.*

# *Practical Construction* *The Radio*

This installment describes a conjunction with the universal power in previous articles of this series, sensitivity and selectivity. The changing over the t.r.f.

***Part Thirteen: A***

***By* John**

A SCHEMATIC diagram with all values of parts for a superhet receiver for the beginner to build is given in Figure 1. Although the principles of the superheterodyne have been discussed in previous articles, there are several points to be observed. The first stage is a tuned radio-frequency amplifier, the main purpose of which is to reduce image response (eliminate stations on a frequency 2x456 kc. away from the desired stations). A second function of this stage is to provide amplification for weak signals. This is especially desirable since the mixer causes less noise when handling larger signals.

## R. F. Circuit

The circuit is nearly identical (and the parts are identical) with that of the first stage of the t.r.f. tuner except for some adjustment in the screen voltage and in the cathode. The first stage had to have an isolated screen circuit for reasons of stability. A voltage divider was needed because the a.v.c. circuit causes large changes in screen current which make the screen voltage vary too much if a dropping resistor alone were used. The sensitivity control R1 was left in the cathode circuit; it can probably be set for the desired sensitivity and left untouched thereafter. The a.v.c. circuit will take care of the rest.

The next stage is the mixer, a 6A8 tube. Here considerable changes are made as compared with the second r.f. stage in the t.r.f. tuner. L2 is the same coil which served us before and will deliver the signal to grid No. 4 of the pentagrid tube.

## Oscillator Data

The inner grids of the tube are used for the oscillator, employing the coil L4, while C3 is the third section of the gang condenser. R13 is a dropping resistor which simply serves to reduce the voltage on the anode grid to the value recommended by the manufacturer.

Circuits L2 and C2 are tuned to the incoming signal and are practically identical to L1 and C1, but L4, C3 and C19 have to be so chosen that the oscillator frequency is always exactly 456 kc. higher than the incoming signal. This can be accomplished by employing an inductance L4 of a smaller size, connecting a "padder" condenser in series with the tuning condenser and properly trimming the individual sections of the condenser gang. Small adjustable trimmers are used in parallel with C1, C2 and C3 (not shown in the diagram).

The exact values of L4 and C19 can be calculated mathematically, but the work is quite involved. It has been spared us by the coil manufacturer, who makes the oscillator coil and specifies the value of C19. In our case (checked by measurement) this value was 380 mmfd. This is an adjustable condenser which is set correctly during the aligning process and thereafter is left severely alone. Note the connection of the condensers in such a way that one side of C19 can be grounded. This is necessary so it can be touched with the screwdriver without changing the tuning.

## The I. F. Amplfier

Within the tube, the frequencies are "mixed"; that is, sum and difference frequency are created besides several others. The tuned circuits in the i.f. transformer L5 select the desired difference frequency—intermediate frequency—which is then amplified in the next stage, employing a 6K7. This is followed by another i.f. transformer and the diode detector.

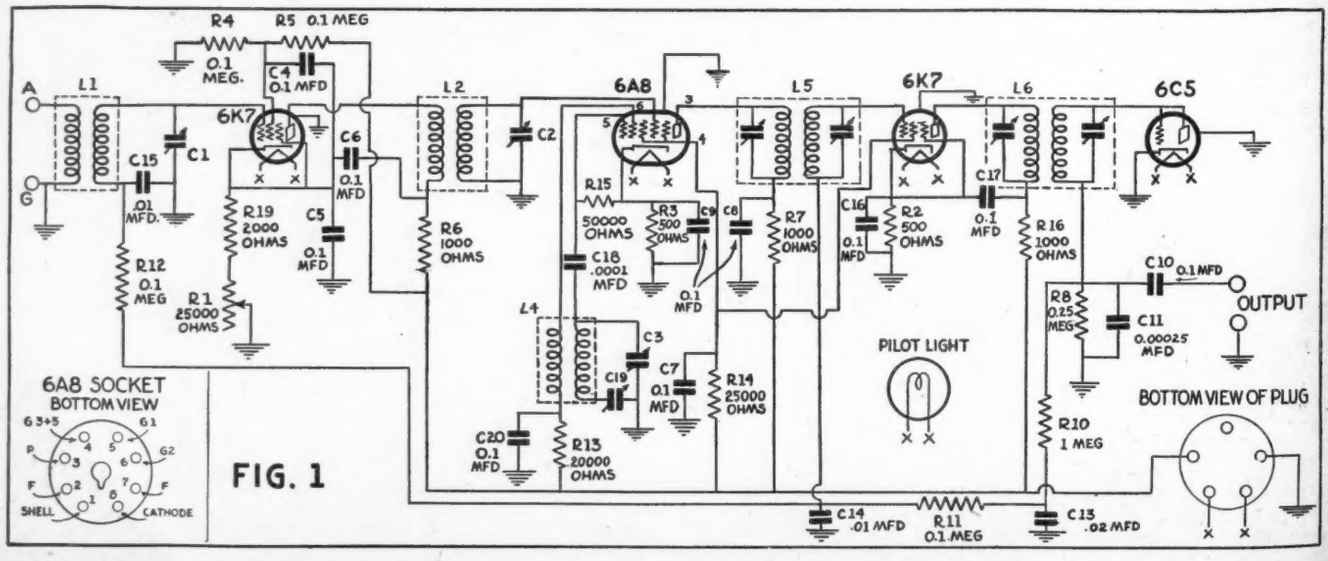
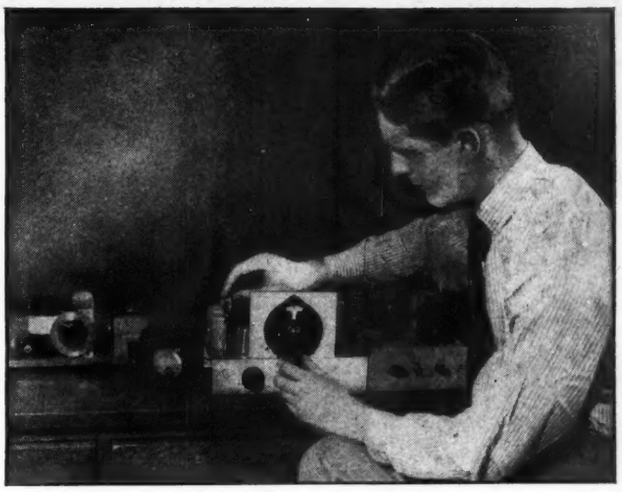



FIG. 1

# *and Instruction for* Beginner

superheterodyne tuner which, in supply and audio amplifier described forms a receiver of excellent superheterodyne is to be made by tuner described previously



TRACKING THE OSCILLATOR

*Complete instructions are provided in this article for building the tuner and aligning it, using the simple test oscillator described in the July installment.*

## *Superhet Tuner*

**M. Borst**

The a.v.c. circuit is the same as it was in the r.f. tuner, now controlling the r.f. amplifier and the i.f. amplifiers. The reason for using a 6C5 as a diode was one of economy, since it had been specified in the original r.f. detector. Those who so desire may substitute a 6H6.

### Construction

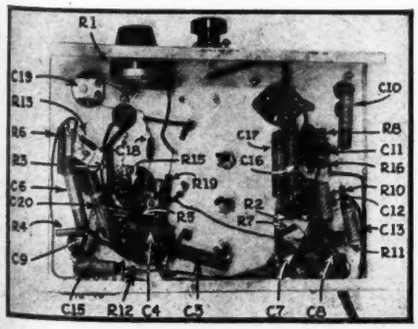
In the schematic diagram and in the parts list, parts which were used in the t.r.f. tuner have the same symbols as they had in previous diagrams. Thus, R1 is the same potentiometer employed in the t.r.f. tuner, L1 the same coil, etc.

Readers who start converting the r.f. tuner may begin by removing L3 with all its wiring, removing all screen wiring, and most of the leads to the second r.f. stage which is to be replaced by the mixer. Leave the filament wires intact. Next the coils L4 and L5 and L6 can be mounted, taking care that they are in their right place. L5 is the one with the grid lead on top. We found it necessary to ream the center hole for L4 somewhat so as to avoid short circuits.

Wiring can now proceed with the usual precautions of keeping leads short. The connections to the oscillator coil, L4, are: green to C18, black to C19, red to R13, blue to anode grid.

The terminal of the padder condenser, C19, which connects to the adjustment screen should be connected to the chassis.

After mounting the parts, the order of work is: wiring the fixed parts first, then resistors, then condensers. Terminal strips have again been provided to anchor the wiring where necessary.

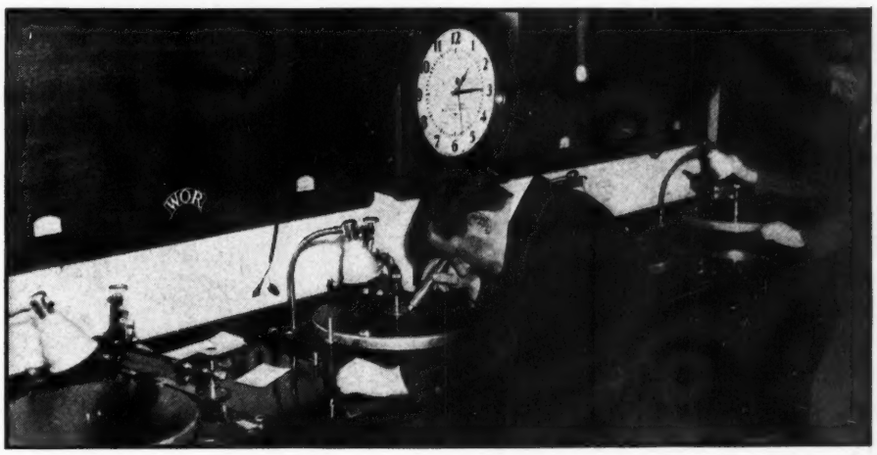



Trimmers have been provided for the tuning condenser—those possessing a gang condenser with trimmers need not purchase these. The trimmers are soldered directly on top of the condenser gang with precaution to see that the adjustment screw is on the grounded side.

The condenser C19 is the only one requiring extra drilling, since no holes were provided for it. It should be mounted close to the oscillator coil, with the adjustment screw sticking through a hole in the chassis. This makes all alignment controls accessible from the top of the chassis.

Those who prefer may move the volume control to the tuner chassis. It should then replace R8. The movable arm of this unit would then connect to C10. In its place in the amplifier a .5 meg. resistor should be connected.

Next take the two remaining .1 mfd. condensers and put them in series across the line in the (*Turn to page* 168)




# *Air* PROGRAMS Recorded

**By Samuel Kaufman**

STATION WOR, 50-kw. station of Newark, New Jersey, has entered the recording business as a lucrative sideline. This is the second auxiliary business for the prominent Eastern transmitter, the first being public-address work with WOR engineers bidding for permanent or temporary p.a. installations.

A modern recording plant was erected at the station's New York studios. Lateral 33⅓ r.p.m. disks are made right off the station line. Recordings are made both for the station's own program purposes and for sponsors and talent at stipulated fees.

One unique application of the recording equipment was made during the British Coronation. Throughout the day, disks were made of the entire Coronation proceedings relayed over the Mutual Broadcasting System which WOR serves as key station. A board of editors played the records, selecting the highlights of each. Then all of the chosen highlights were recorded anew on two 15-minute disks and the half-hour program of the original, but edited, Coronation proceedings was broadcast at night when many business people who were unable to tune in earlier in the day stood by for the novel presentation.

# The RADIO WORKSHOP

Items of interest for beginners, experimenters and radio constructors.

*Conducted by* the Associate Editor

## Two Useful Earphone Circuits

It's a proven fact that a good pair of earphones is superior to a loudspeaker for the reception of weak signals. The experienced DX hunter knows this and turns to his phones when fine work is to be done. There is, however, a decided prejudice against the use of phones by many of the newcomers to DX hunting. This feeling can usually be traced to an initial experience where phones were used in a set which did not provide them with proper volume control.

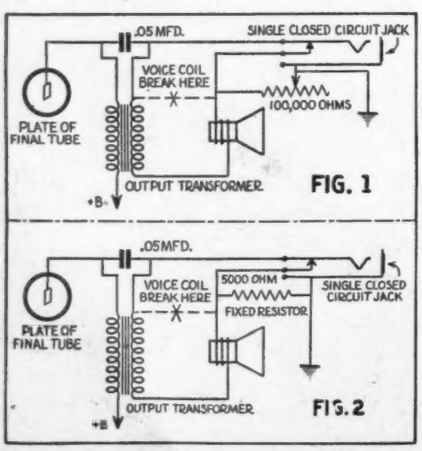
It has been a general practice to place the phone jack in the circuit directly after the first stage of audio amplification and in some receivers this works out satisfactorily. There are, however many cases when more audio amplification could be used to advantage. The signal-to-noise ratio on most superheterodynes, for instance, can be increased by reducing the i.f. gain and increasing the audio amplification. Also on many regenerative and t.r.f. receivers one stage of audio, resistance-coupled to the phones, is not quite enough. On the other hand, when the phone-jack is installed in the final output stage there is too much gain for comfort and the volume control often becomes critical.

The two circuits shown are designed to overcome these common faults and give perfect earphone control on any type of set. Either one can be easily incorporated in sets which now lack phone connections. Figure 1 serves two purposes: it acts as a volume control for the earphones, when they are inserted in the jack and when the earphones are removed the same potentiometer serves as tone control for the speaker. Sets which already have a tone control in the plate circuit of the output tube can be shifted over to this circuit by the simple expedient of mounting a single closed circuit jack on the chassis and cutting it in on the voice coil of the speaker as shown in the diagram.

Figure 2 is essentially the same circuit except that a fixed resistor is used, the value of which has been chosen so that the maximum audio gain that can be utilized is delivered to the phones and yet they are protected against overloading even when the regular volume control on the receiver is fully advanced. Both of these arrangements allow the regular volume control on the receiver to operate smoothly in a normal manner, without critical adjustment.

In both of these circuits the earphones are isolated from the high-voltage d.c. so that they cannot be harmed and are operating at their maximum efficiency. This also eliminates any chance of shock from the phone plug or case. It will also be noted that the speaker is cut out when the phones are in use.

A. J. HAYNES,
New York City, N. Y.

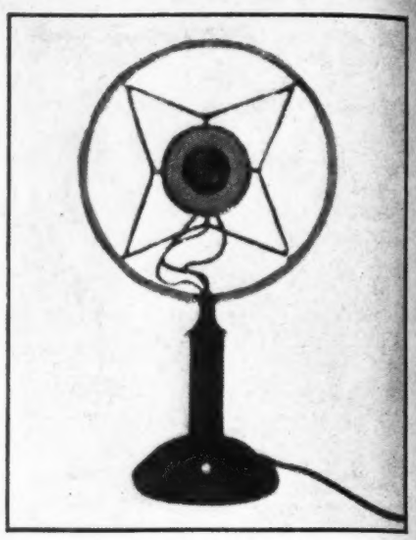



## Specialists In Small Parts

Every experimenter has had the annoying experience of being held up in his work for lack of a certain size shaft coupling, piece of tubing or special radio hardware. The American Radio Hardware Company specializes in just such accessories and hardware, they manufacture a varied line in steel, brass and plastics which, to mention a few in addition to the above, includes self-tapping screws, terminal strips, angle and bracket assortments, test prods, alignment tools, etc.

## Time Saver for Servicemen

This RCA "Pindex" tube card is a pocket-size celluloid covered slide-chart which tells at a glance the prong positions, the cathode type, amperes and volts for over 120 most popular used tubes. Its operation is extremely simple, it is only necessary to pull the slide out until the tube number desired appears in its respective window, beside the indicated socket.



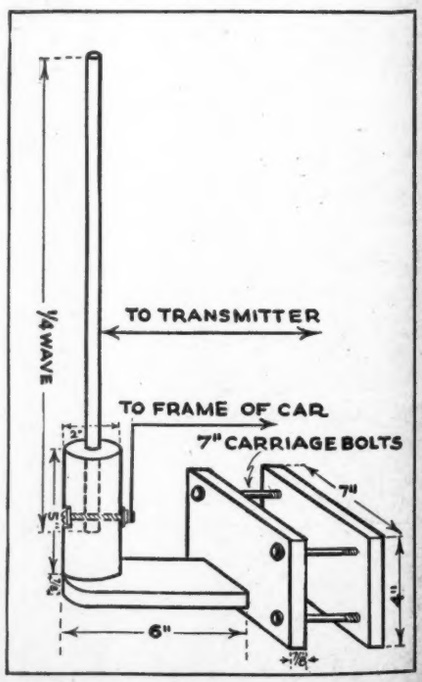
## Homemade Mike Stand

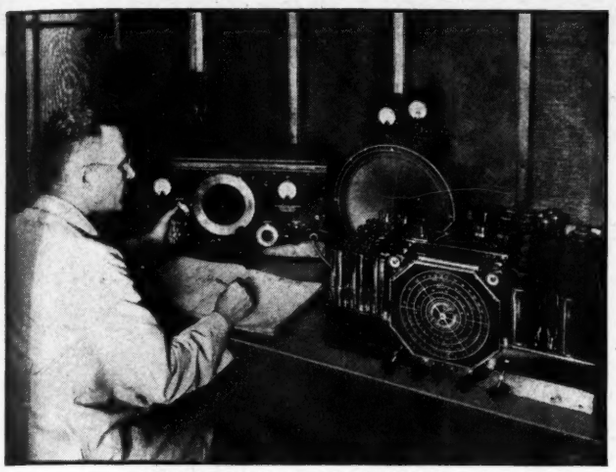
Here is a desk type microphone stand that can be made from an old telephone stand, a piece of brass rod ⅜ inch wide, 8 large rubber bands and the necessary screw-eyes. The first thing to do is to saw ¾ of an inch off the top of the stand. This cutting operation is made at the transmitter swivel point or fork in which the phone transmitter was mounted. The idea is to leave a ¼ inch slot in this fork for mounting the microphone ring which is made from the brass rod. Bend the ¼ inch square rod into a circle of the desired diameter and braze or solder the ends together. Solder the ring to the transmitter crotch. It makes a better looking job if the ring is first let into the slot and then soldered. Mount the screws around the ring and the mike as illustrated. Drill two holes for leads through the ring to connect with the hole already in the slot, string the rubber bands, connect the leads and the microphone and the job is finished.

## Bumper Rod Antenna

Here is an easily constructed single-wire feeder, matched-impedance antenna for use with 5-meter mobile rigs. The drawing is self-explanatory and the few words I can add to the explanation, are to advise that the aerial itself is a piece of one-half

(*Turn to page* 168)





CHECKING PERFORMANCE

*One of the several shielded test booths in the Scott laboratories where the performance of each individual receiver is carefully measured.*

# *New* "Philharmonic" 30-TUBE Receiver

## *(Latest Scott Custom-Built Set)*

**By Laurence M. Cockaday and S. Gordon Taylor**

*(Part Two)*

**A GENERAL description of this new Scott receiver will be presented in this article, and also a series of measurements to illustrate the unusually excellent characteristics which the designers have been able to incorporate in this de luxe receiver.**

THE receiver consists of two chromium plated chassis, one of which constitutes the receiver proper, with 24 tubes; the other, with 6 tubes, the power supply and 40-watt power-amplifier output stage. These two units and the loudspeaker are interconnected by means of plugs and cables which make the installation of the equipment simple and fool-proof.

### The Tuning Range

The tuning range is from 150 to 80,000 kilocycles, divided into 6 bands and covered continuously except for a gap extending from 410 to 540 kc. Each range is accurately calibrated in frequency on the large tuning dial and in addition this dial also shows the types of services to be heard at various parts of the tuning range. The tuning control provides two speeds through two concentric knobs. The larger one is employed for quick coverage, and for all tuning at the lower frequencies. In tuning the short waves, where the tuning is normally rather critical, the smaller knob provides a greatly increased ratio which makes such tuning easy. Also for convenience in tuning the short waves, there is a small pointer which moves over a second scale in the center of the main dial and by means of this stations, even on the highest frequencies, may be readily logged and tuned in again at this same setting of the second hand.

The seven other controls on the panel are: the selectivity-high fidelity, audio volume, bass control, manual sensitivity, wave-band switch, volume expansion control and scratch-suppressor push switch.

### External Connections

Connections are provided at the rear of the chassis for either standard or doublet antennas, and also for a phonograph pick-up. Connections for headphones are provided on the power-supply chassis, in the form of a 2-position phone jack. With the headphone plug inserted all the way the loudspeaker is cut out of the circuit, but when the plug is inserted only part way the headphones and the loudspeaker are both in the circuit.

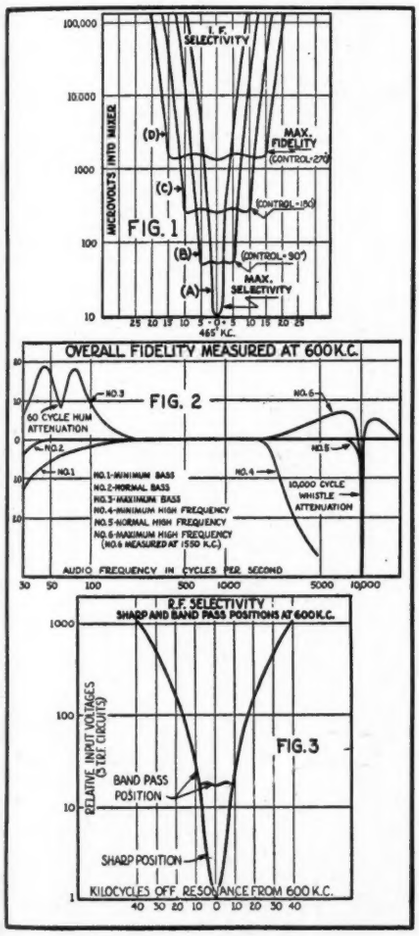
### 30 "G" Tubes

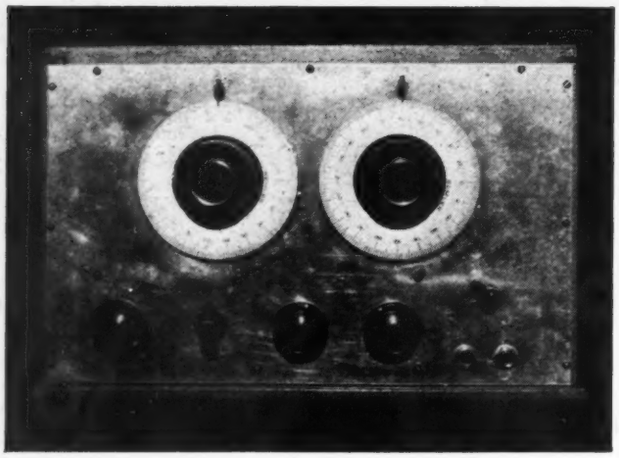
Glass tubes are used throughout, it having always been the contention of this manufacturer that metal tubes offer no worthwhile advantages over glass, and that many types had distinct disadvantages. It is interesting to note in passing that this year many other manufacturers who have been using metal tubes exclusively are reverting to the use of glass tubes for some purposes in their lines of new models announced for the 1937-8 season.

### Types and Functions

The tube complement of the "Philharmonic" is as follows: Two 6U7G's as r.f. amplifiers, 6L7G mixer, 6J5G oscillator, VR-150 oscillator-voltage regulator (which maintains the oscillator plate voltage constant within 2/10 volt), 6K7's in three i.f. stages, 6B8G as fourth i.f. amplifier and second detector, 6J5G first a.f. amplifier, 6J5G phase inverter, two 6L7G's as a push-pull volume expander amplifier with a 6J5G and a 6H6G as expander driver and rectifier, two 6J5G's in push-pull to drive four 6L6G's connected in push-pull parallel for 40 watts of undistorted output. The two automatic gain control systems, one for r.f. control and the other for i.f. control, are of the amplified type and each employs a 6B8G tube. A 6H6G is used in a special manual sensitivity control system, the record scratch suppressor circuit employs a 6J7G and a 6B8G, a 6G5 serves as the tuning indicator, a 6E5 as the expander indicator and two 83V's are required in the power unit which supplies the B and C voltages. These rectifiers work through a filter consisting of chokes of 30 and 10 henries, the speaker field, and 160 mfd. capacity.

Space does (*Continued on page* 181)





THE 3-BAND "CRUISER," FRONT VIEW

*Figure 1: The symmetrical layout of the controls makes for ease in operation as well as an attractive appearance*

## *Short-Wave Listeners*

# 3-BAND

This little receiver features ease of ing, detector regeneration, a tuned spread and a continuous range of make it an ideal construction

***By* Americus**

**THE majority of short-wave receivers described recently have been of the super-heterodyne variety. Because of the lack of selectivity of the regenerative receiver it seems to be rapidly passing into the background, but it cannot be denied that for the simplicity of design, low cost, and results obtained, this sensitive type of circuit certainly deserves more extensive consideration and development.**

THE 3-band "Cruiser" to be described is a short-wave, band-switching, four-tube regenerative receiver with fine power and sensitivity. It is simple and economical to build and the coils may be easily wound by hand. The set was designed primarily for the 20, 40, and 80-meter amateur bands, but can be tuned to any intermediate wavelength desired.

The band-switching arrangement is of straightforward design, the only precaution being to keep leads as short as possible, especially those comprising the highest-frequency circuits. The layout is shown in Figure 2. The coil shields were taken from an old, discarded Crosley receiver, but any three-inch diameter cans will be suitable. The detector grid-leak and condenser are mounted directly on the band-setting condenser.

### The Layout

Figure 1 shows a front view of the receiver. The large Remler dials were used to facilitate rapid tuning. The left-hand dial controls the band-setting condenser, while the one on the right serves as a band-spread control. On the lower portion of the panel, from left to right, are the sensitivity control, band switch, r.f. compensating condenser control, and regeneration control. Following these can be seen the phone and loudspeaker jacks, while directly above is the B— negative switch.

The whole set is mounted on a Bud steel chassis measuring 7 by 12 by 3 inches but a slightly larger chassis may prove preferable. The panel is made from a piece of sheet aluminum measuring 8 by 13 by 1/16 inches. A thin sheet of steel is used to cover the bottom of the receiver chassis to shield the wiring from external pick-up.

All secondaries are wound with No. 24 double-cotton-covered wire, and the plate coils with No. 30 double-cotton-covered wire. One-inch diameter bakelite tubing is used for all coils. The various leads are passed through 3/16-inch holes to the underside of the chassis.

### The Coil Design

As the coil in the r.f. stage is the basis for the design of all the others, its construction will be considered first. Starting at one end of the bakelite tubing, and with spacing equal to the diameter of the wire, wind on 8 turns and make a tap by twisting out a small loop of the wire. From this point continue the same spaced winding and take off a tap at the 15th turn. From here on the coil is close-wound until a total of 35 turns is reached. This completes the winding. By employing these taps, the coils are made to tune the r.f. stage over the 20, 40 and 80 meter bands. The spacing between turns is secured by winding a cord alongside the wire and removing it when the coil is completed.

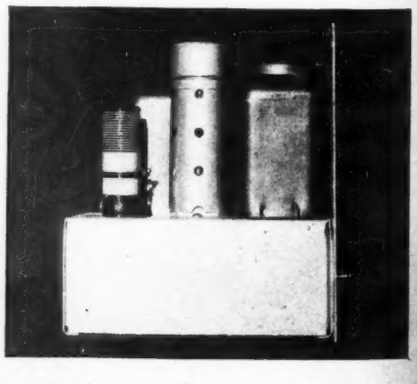
### Winding Grid Coils

The various detector grid coils must be wound identically the same as the corresponding portion of the r.f. coil in order to make the circuits track properly. Although this may seem rather difficult at first, it is really comparatively easy. In winding the 80-meter grid coil it will be noted that the first fifteen turns are space-wound and the remainder close-wound in order to make it similar to the r.f. inductance. A view of this coil is shown, with shield removed, in Figure 3. The bottom winding is the primary.

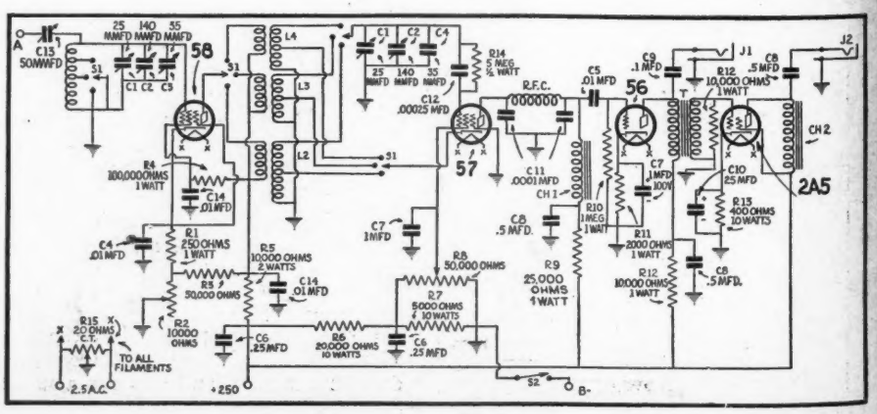
The cathode tap for the 20-meter grid coil is made 2/3 of a turn from the end of the winding, that of the 40-meter coil is made 1¼ turns from the end, and that of the 80-meter coil is made 2 turns from the end (in the close-wound portion). The primaries for the 20, 40, and 80-meter bands

THE R. F. COIL ASSEMBLY

*Figure 3: Showing the simple construction of the hand-wound coils, when the shield is removed.*



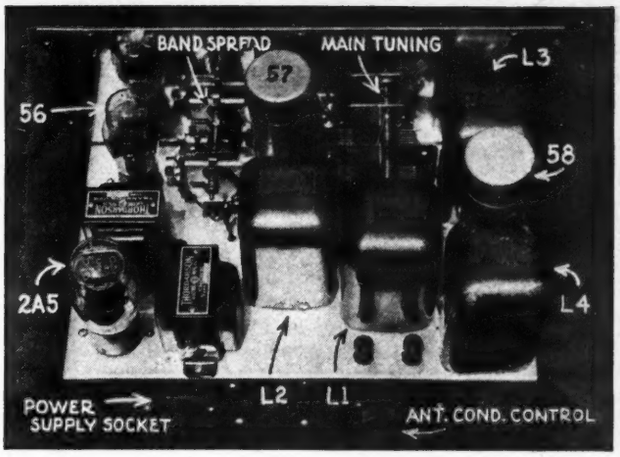
CIRCUIT DIAGRAM



# *and Amateurs—Build this* "CRUISER"

construction, low cost, band-switch-preselector stage, electrical band-2.6 to 16 megacycles, all of which model for the "kitchen mechanic".

**Molinara (W3AGJ)**




THE CHASSIS LAYOUT FOR THE SET

*Figure 2: Showing the compact and efficient arrangement of the principal components of this sensitive receiver*

consist of 7, 14, and 28 turns respectively, spaced ⅛ inch from the secondaries. The primaries are wound on the ground sides of the secondary coils. All the finished coils are given a coat of collodion.

The tuning condensers in the r.f. and detector circuits are ganged with the exception of condensers C3 and C4, the latter being fixed and made from a few plates of a midget variable to equal about two thirds the capacity of C3. The condenser C4 is mounted on top of the chassis below the band-spread tuning condensers. The purpose of C4 is to balance the capacity of C3 so that the r.f. stage can be peaked exactly. At any setting of the tuning condensers it should be possible to peak the circuits with the aid of C3. If it is found that this cannot be done, tune the antenna series condenser, C13, until the desired result is obtained.

Figure 4 shows the wiring beneath the chassis. At the top-center is the detector audio-coupling choke and to the right is the antenna series condenser. At the bottom center is the r.f. compensating condenser C3. The unused terminals of the band switch serve as terminal supports for various resistors and condensers. To simplify wiring, all grounds are made to the chassis.

The receiver gain was so great it was necessary to shunt a 10,000 ohm resistor across the secondary of the audio transformer. Builders may prefer to omit this resistor, or use a higher value.

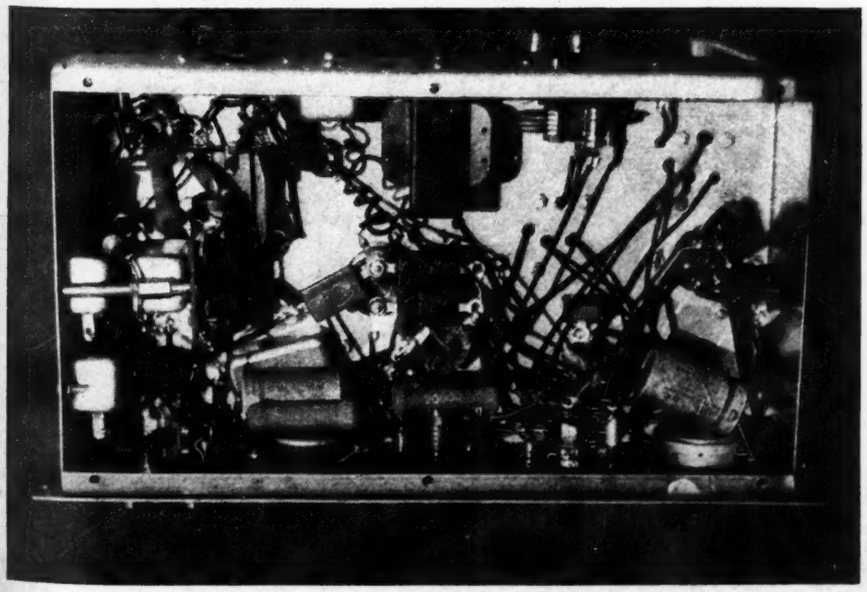
## Fine Performance

If any instability is experienced in the r.f. stage it can be cleared up by turning down the sensitivity control potentiometer, R2.

The results obtained with this receiver are very gratifying. Amateur stations can be made to come through with such force as to make it unpleasant for the ears, while foreign broadcasts can be tuned in with ease. The different circuits have been thoroughly filtered by resistors and condensers so that hum and line voltage fluctuations have little effect upon signals. The tuning range is approximately 2600 kc. to 16,000 kc.

A SET-BUILDER'S VIEW

*Figure 4: Showing the wiring and parts arrangement underneath the metal chassis of this receiver*



## List of Parts

C1 Cardwell midget condenser, type ZR25-AS
C2 I.C.A. two-gang condenser, 140 mmf. per section
C3 Pilot condenser, midget, 5-plate or equivalent, 35 mmfd.
C4 Fixed condenser, about 35 mmfd. (see text)
C5 Mica condenser, .01 mfd.
C6 Paper condenser, .25 mfd., 400 volts
C7 Electrolytic condenser, 1 mfd. (or larger) 100 volts
C8 paper condenser, .5 mfd., 400 volts
C9 Paper condenser, .1 mfd., 400 volts
C10 Electrolytic condenser, 25 mfd., 35 volts
C11 Mica condenser, .0001 mfd.
C12 Mica condenser, .00025 mfd.
C13 Pilot midget condenser, 7-plate, or equivalent, 50 mmfd.
C14 Paper condenser, .01 mfd., 200 volts
Ch1 Thordarson 1080 henry choke, type T2927
Ch2 Thordarson 22 henry choke, type T6808
J1 J2, Yaxley infant jack, No. A-1
L1 R.F. coil
L2 20-meter det. coil
L3 40-meter det. coil
L4 80-meter det. coil
R1 Carbon resistor, 250 ohms, 1 watt
R2 Yaxley wire-wound potentiometer, 10,000 ohms, type 7021
R3 Carbon Resistor, 50,000 ohms, 1 watt
R4 Carbon Resistor, 100,000 ohms, 1 watt
R5 Carbon Resistor, 10,000 ohms, 2 watts
R6 Wire-wound resistor, 20,000 ohms, 10 watts
R7 Wire-wound resistor, 5,000 ohms, 10 watts
R8 Centralab potentiometer, 50,000 ohms, type 72-103
R9 Carbon resistor, 25,000 ohms, 1 watt
R10 Carbon resistor, 1 meg. 1 watt
R11 Carbon resistor, 2,000 ohms, 1 watt
R12 Carbon resistor, 10,000 ohms, 1 watt
R13 Wire-wound resistor, 400 ohms, 10 watts
R14 Carbon resistor, 5 meg. ½ watt
R15 Resistor, center tapped, 20 ohms
RFC Radio frequency choke 2.5 m.h.
S1 Yaxley selector switch, type 1325
S2 Yaxley jack switch, s.p.s.t., type 720
T—Thordarson audio transformer, T5736

## Improved Quality of Remote-Control Broadcasts

NEW YORK, N. Y.—The National Broadcasting Company is supplying to eight key points across the country, seventy new field amplifiers, and 200 new microphones. The new equipment was developed by NBC engineers and is of such an improved type as to make the remote control broadcasts equal in quality to studio broadcasts. The amplifiers weigh 30 pounds, have a gain of 100 db., and reproduce the entire audio range from 30-15,000 cycles.

## W3XAL's New Antenna

BOUND BROOK, N. J.—A new directional antenna erected at Bound Brook, N. J., is responsible for marked improvements of reception in South American countries. The South American antennas consist of wires having the shape of a large "V" with the apex supported on a 502-foot steel tower. The two ends are supported by 165-foot wooden poles. Several other antennas are used in connection with W3XAL. The signal strength at Buenos Aires is reported to be 500 to 1700 microvolts-per-meter. The station transmits 22 Spanish programs a week.


AN UNUSUAL FRENCH LISTENING POST
*This is the DX Corner of Observer Robert Muguet of Meudon, France. Two Superheterodynes are used.*

# *The* DX *for* SHORT

***Conducted by***

**THE Fifty-Fourth installment of the DX Corner for Short-Wave contains the World Short-Wave Time-Table for 24-hour use all over the world and Official Observers' reports of stations heard this month. Consult these two items regularly and make your allwave set pay big dividends!**

## Credit Where It Is Due

The following Listening Post Observers are commended for their very outstanding reports this month: Williams, Alfred, Diez, Gallagher and Hartzell. The "star" class of observers is rather small, possibly on account of vacations. These five observers certainly did a high standard of reportorial work.

## New Short Wave Observer Appointments

The directors of the DX Corner announce the appointments of and welcome the following short-wave enthusiasts as Official Radio News Listening Post Observers: John Fitzpatrick, New Jersey; Vernn Alford, Oklahoma; Harold E. Lindner, Wisconsin; Alfred A. Smith, Massachusetts; A. E. Redmond, Washington; James E. Moore, Jr., California; Angelo M. Rosa, New York; A. Sainz de la Pena, Cuba; Edward O. Sculley, Massachusetts; Charles Pierce, California; Bryant B. Bedinger, California.

## News Notes

Observers Burnell Unger, of Hanover, Pa., and James Doyle, of Florence, Colorado, state that they will be glad to exchange cards and correspondence with other short-wave listeners in foreign countries, especially the Far East.

## Reports Pouring In

Your Editor wishes to thank all observers who have sent in reports on his amateur station W2JCY. These have been very gratifying both on the 5-meter signals and on the 10-meter signals. We hope that many additional reports will be included during the coming month.

## Reports of Listening Post Observers and Other Short-Wave Readers of the DX Corner

**LISTED in the following columns is this month's consolidated reports of short-wave stations heard by our wide-world listening posts. Each item is credited with the Observer's surname. This allows our readers to note who obtained the information. If any of our readers can supply Actual Time Schedules, Correct Wavelengths, Correct Frequencies and any other Important Information (in paragraphs as recommended), the DX Editor, as well as our readers, will be grateful for the information. On the other hand, readers seeing these reports can try their skill in pulling in the situations logged and in trying to get complete information on these transmissions. The report for this month, containing the best information available to date, follows:**

### Europe

**LZA**, Sofia, Bulgaria, 14,945 kc., signing Saturday 4:30 p.m., (Hartzell), 14,890 kc., Sunday 1 a.m., (Diez, Eder), 14.940 kc., (Hartman).

**PCJ**, Hilversum, (Huizen), Holland, 9590 kc., Sunday 7-8 p.m., Wednesday 7-10 p.m., (Dressler, Beck, Eder, Westman), 9-11 p.m., (Alfred, Hedgeland, Kemp, Hartzell, Pylate, Coover, Yoshimura, Gallagher, Hendry Shamleffer).

**PHI**, Huizen, Holland, 17,775 kc., Monday, Thursday, Friday, Saturday, 7:30-9:30 p.m., (from ann.), (Doyle, Hedgeland, Pylate, Davies).

**HAT4**, Budapest, Hungary, 9120 kc., 7:15 p.m., (Eder), Sunday 7-8 p.m., (Alfred), Saturday 6-7 p.m., (Smith), Wednesday 6-7 p.m., Saturday 5-6 p.m., (from ann.), (Fallon, Westman), 9135 kc., (Doyle, Hedgeland, Sakely, Dressler,

**HAS3**, Budapest, Hungary, 15,370 kc., 9:50 p.m., (Eder), 9-10 a.m., (Alfred, Hedgeland).

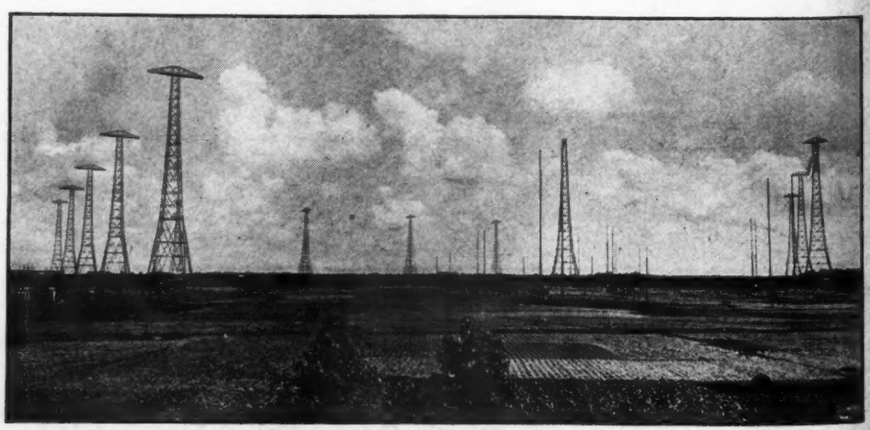
**LKJ1**, Oslo, Norway, 9530 kc. (Ruiz), Jeloy, Norway, 6130 kc., 9:15 a.m.-6:15 p.m., (McCartin), daily 5:15-8 p.m., 11 a.m.-5 p.m., Saturday 5:15-9 p.m., (Hedgeland).

**ORK**, Ruysselede, Belgium, 10,400 kc.. (Ruppert. Hedgelan Sakely), 9520 p.m., (Williams, Diez, Hedgeland).

**SPW**, Warsaw, Poland, 13,635 kc., Wednesday 1-1:30 p.m., (Alfred), Monday, Wednesday, Friday, 12:30-1:30 p.m., (from veri.), (Smith, Eder, Doyle, Hedgeland), Sunday, 12-1:30 p.m., (Fallon, Shamleffer).

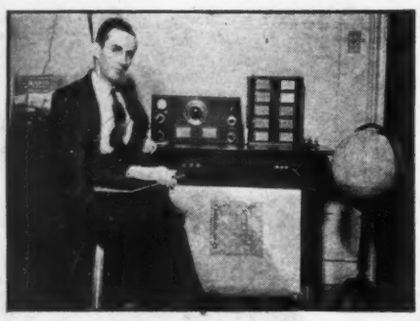
**SPF**, Gdynia, Poland, 12,310 kc., (Bower). Slogan: "Radio Gdynia."

**OER2**, Vienna, Austria, 11,801 kc.,



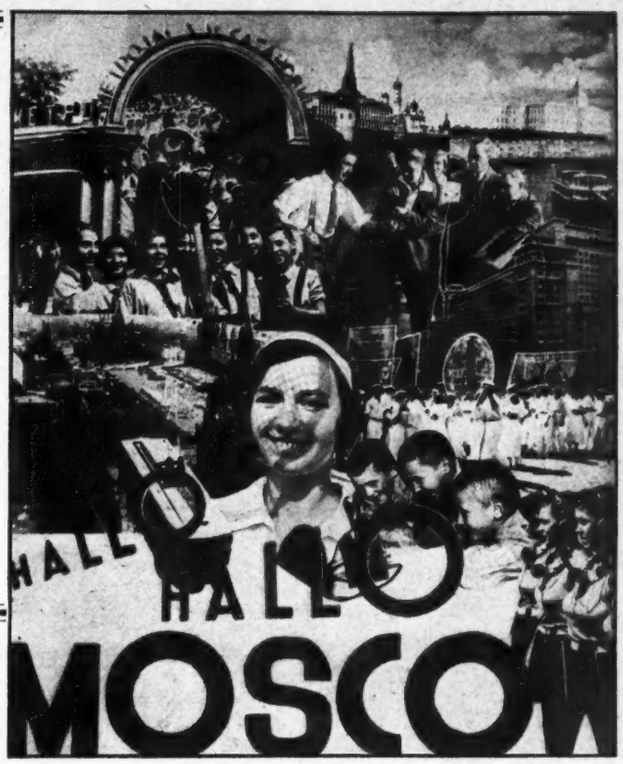
THE NAZAKI TOWERS
*Observer A. T. Yamamoto sends us this view of the Great Towers of the Nazaki Broadcaster.*

ALL SHIP-SHAPE IN BROOKLYN
*Official Observer Kenneth Dressler sends greetings to all Radio News observers as he sits alongside his HRO.*



# Corner *the* WAVES

**L. M. Cockaday**




ARTISTIC
*A "Veri" from RAN received by Meade Williams for his station reports*

(Millen), week days 9 a.m.-5 p.m., Saturday 9 a.m.-6 p.m., (from veri.), (Wilson), 11,780 kc., (Hartzell). Address: Oesterr. Radio-Verkehrs A. G., Wien I, Johannesgasse 4B.

**OXY,** Skamlebaek, Denmark, 6060 kc., (Ruppert, Hedgeland, Sakely), 9520 kc., Sunday 7 p.m., (Fallon, Bower).

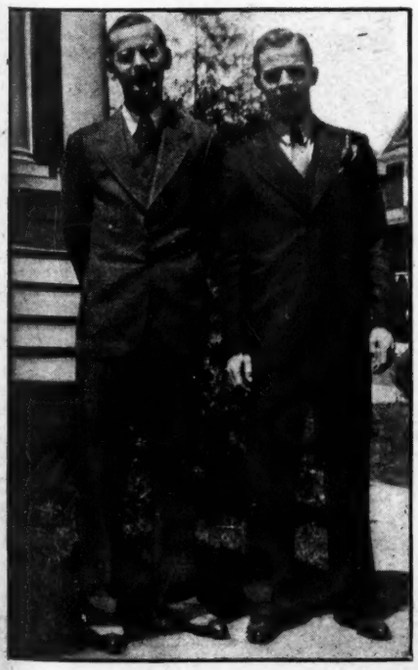
**TFJ,** Reykjavik, Iceland, 12.234 kc., 1:40-2:30 p.m., Sundays, (Alfred, Pylate, Shamleffer), Address: State Broadcasting Service, P. O. Box 547.

**PCV,** Kootwijk, Netherlands, 17,810 kc., 10:10 a.m., (Alfred, Eder).

**SM5SX,** Stockholm, Sweden, 11,710 kc., Sunday signing at 8 a.m., (Hartzell), 11 a.m.-5:15 p.m., (Doyle).

**YTC,** Belgrade, Yugoslavia, 11,700 kc., Monday 7:15-8:20 p.m., (Stabler), daily 2:30-5 p.m., (Sakely), 6100 kc., (Hare).

HERE WE ARE!
*Away up in Torrington, Conn., are two short-wave enthusiasts our readers are glad to welcome. They are, left: Francis Lauf and right: George Kozlak.*



**SBG,** Motala, Sweden, 6060 kc., 11,700 kc., irregular, (Stevens, Beard, Ruppert), daily until 1:30 p.m., (Hedgeland), daily 8 a.m.-2:30 p.m., (Partner).

**OLR2A,** Prague, Czechoslovakia, Monday, Wednesday, Friday, 4-4:30 p.m., (Unger).

**OLR3A,** Podebrady, Czechoslovakia, 9645 kc., 6:51 p.m., (Diez), Saturday, Sunday, Tuesday, Thursday, 4-4:30 p.m., (Unger)

**OLR4A,** Prague, Czechoslovakia, 11,840 kc., daily 2:30-4:30 p.m., (Dressler), Monday, Thursday, 7-9:10 p.m., (Blanchard, Relat, Myers, Eder, Westman, Williams, Alfred, Gallagher, Stabler, Alexander, Wilson, Foshoy, Stevens, Magnuson, Law, Lara, Hedgeland, Kemp, Fallon, Hare, Skinner, Partner, Dunn, Shamleffer, Unger, Hartman), Address: Praha 12, Fochova 16.

**OLR5A,** Prague, Czechoslovakia, 15,230 kc., daily 2-2:15 p.m., Monday, Thursday via OLR4A, 8-10:10 p.m., daily 7:55-9:50 a.m., (Dressler, Myers, Westman, Williams, Alfred, Stabler, Alexander, Fritsch, Wilson, Foshay, Stevens, Magnuson, Law, Eder, Hedgeland, Chagaris, Fallon, Hare, Skinner, Partner, Oglesby, Coover, Shamleffer, Unger, Birnie), Address: Praha 12, Fochova 16.

**OLR,** Prague, Czechoslovakia, 9500 kc., 4-5:30 a.m. with chimes, (Ruiz), 8 p.m., (Coover, Gallagher).

**RNE,** Moscow, U.S.S.R., 12,000 kc., 10:15-11:30 p.m., (Alfred, Williams), Sunday 6-7 a.m., (Fallon, Smith), Sunday 10-11 a.m., 4-5 p.m., Wednesday 6-7 a.m., 4-5 p.m., (from veri.), (Stiles, Lara, Margrie, Fallon, Shamleffer, Nigle, Robinson, Hartzell).

**RAI,** Moscow, U.S.S.R., 19.92 meters, (Tate).

**RAN,** Moscow, U.S.S.R., 9600 kc., daily 7-9:15 p.m., (Myers, Eder, Williams, Alfred, Jaime, Doyle, Lara, Wollenschlager, Stiles, Tate, Jordan, Dressler, Shamleffer, Nigh).

**RW59,** Moscow, U.S.S.R., 6000 kc., daily 2:30-5:30 p.m., (White).

**RV59,** Moscow, U.S.S.R., 12,000 kc., 7-9:15 p.m., (Pylate).

**RKI,** Moscow, U.S.S.R., 9521 kc., (Williams), 15,040 kc., 7:30 p.m., (Magnuson, Eder, Kemp, Chagaris), daily 7-9:15 p.m., reports requested, (Fallon, Hartzell, Lorvig, Hendry, Blanchard, Stabler, Jordan, Dressler, Shamleffer, Welper, Hartzell, Partner, Markuson), Address: Radio Centre.

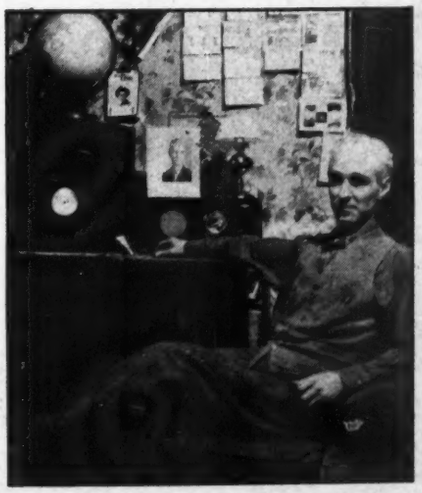
**RAEM,** North Pole, U.S.S.R., 20 and 40 meters, operator is "Krenkel," (from RNE veri.), (Margrie).

**I2RO3,** Rome, Italy, 9635 kc., Monday, Wednesday, Saturday, 6-7:30 p.m., (Alfred), 11,810 kc., (Fallon), Friday 7:15 p.m., (Chagaris), 11 a.m.,-12:15 p.m., Sunday, (Pylate), daily 5-11 p.m., (Nigh), wants reports, (Gallagher, Davies), 6:15 p.m., Lara), 11,810 kc., 6-7:30 p.m., (Partner, Yoshimura).

**HVJ,** Vatican City, 5970 kc., (McCartin), Monday to Saturday 10:30-

(*Turn to page* 164)

WILL HE BE SURPRISED?
*A friend of Forest Bishop who is a great DX'er with his Wilcox-Gay receiver sent in this photograph of Mr. Bishop. Again we ask the question "Will he be surprised?"*



# WORLD SHORT WAVE TIME-TABLE

*Compiled by* LAURENCE M. COCKADAY

Hours of transmission for the World's Short Wave Broadcast Stations

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | FILL IN LOCAL TIME | | | | | |
| 8 | 9 | 10 | 11 | M | 1 | 2 | 3 | 4 | 5 | 6 | 7 | EASTERN STANDARD TIME |
| 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | GREENWICH MEAN TIME |

| Wave-length Meters | Call Letters | Frequency Kc. | City Country | HOURS OF TRANSMISSION |
|---|---|---|---|---|
| 13.93 | W8XK | 21540 | Pittsburgh, Pa. | D |
| 13.93 | GSJ | 21530 | Daventry, England | D D D D |
| 13.94 | W2XE | 21520 | New York, N. Y. | D |
| 13.97 | GSH | 21470 | Daventry, England | D D D D |
| 15.77 | HS8PJ | 19020 | Bangkok, Siam | D D |
| 16.86 | GSG | 17790 | Daventry, England | D D D D D D D D D D |
| 16.87 | W3XAL | 17780 | Bound Brook, N. J. | D D D D D D D D D D D D |
| 16.88 | PHI | 17770 | Huizen, Holland | XW XW S |
| 16.89 | W2XE | 17760 | New York, N. Y. | D |
| 16.89 | DJE | 17760 | Zeesen, Germany | D D D S S |
| 19.56 | DJR | 15340 | Zeesen, Germany | D D D D D |
| 19.57 | W2XAD | 15330 | Schenectady, N. Y. | D D D D D D D D D D |
| 19.60 | GSP | 15310 | Daventry, England | D D |
| 19.62 | LRU | 15290 | Buenos Aires, Arg. | D |
| 19.63 | DJO | 15280 | Zeesen, Germany | D D D S S D D D D |
| 19.65 | W2XE | 15270 | New York, N. Y. | S S D XS D |
| 19.66 | GSI | 15260 | Daventry, England | D D D D |
| 19.68 | TPA2 | 15243 | Pontoise, France | D D D |
| 19.70 | OLR5A | 15230 | Podebrady, Czech. | D D D D |
| 19.71 | PCJ | 15220 | Huizen, Holland | W W W |
| 19.72 | W8XK | 15210 | Pittsburgh, Pa. | D D D D D D D D D |
| 19.74 | DJB | 15200 | Zeesen, Germany | D D D S S D D D D |
| 19.75 | ZBW4 | 15190 | Hong Kong, China | D D SA |
| 19.76 | GSO | 15180 | Daventry, England | D D D D |
| 19.79 | JZK | 15160 | Nazaki, Japan | D D D D |
| 19.82 | GSF | 15140 | Daventry, England | D D D D D |
| 19.84 | HVJ | 15121 | Vatican City | I |
| 19.85 | DJL | 15110 | Zeesen, Germany | D D D D D D D |
| 19.95 | RKI | 15040 | Moscow, U.S.S.R. | D |
| 20.04 | LZA | 14970 | Sofia, Bulgaria | S S S U U S S |
| 22.16 | SPW | 13653 | Warsaw, Poland | C C C S S S |
| 24.52 | TFJ | 12235 | Reykjavik, Iceland | S S |
| 25.00 | RV59 (RNE) | 12000 | Moscow, U.S.S.R. | S H |
| 25.24 | TPA3 | 11885 | Pontoise, France | D D D D D D |
| 25.27 | W8XK | 11870 | Pittsburgh, Pa. | D |
| 25.34 | OLR4A | 11840 | Podebrady, Czech. | D D D AM |
| 25.36 | W2XE | 11830 | New York, N. Y. | D D |
| 25.36 | W9XAA | 11830 | Chicago, Ill. | D D D D I I D D I |
| 25.40 | I2RO4 | 11810 | Rome, Italy | D D D D I I I I I I I |
| 25.42 | COCQ | 11800 | Havana, Cuba | D D D D D D D D D D D D |
| 25.42 | JZJ | 11800 | Nazaki, Japan | D D D |
| 25.49 | DJD | 11770 | Zeesen, Germany | D D D D D D D D D D |
| 25.53 | GSD | 11750 | Daventry, England | D D D D D D |
| 25.58 | CJRX | 11730 | Winnipeg, Canada | D D |
| 25.60 | TPA4 | 11720 | Pontoise, France | D D |
| 25.62 | HJ4ABA | 11710 | Medellin, Colombia | D D I D D |
| 26.24 | COCX | 11435 | Havana, Cuba | D D D D XS S S |
| 26.60 | HIN | 11280 | Trujillo, D. R. | XS |
| 27.17 | CSW | 11040 | Lisbon, Portugal | D D D D D D |
| 28.93 | EAJ43 | 10370 | Tenerife, C. I. | D D D D D |
| 29.04 | ORK | 10330 | Ruysselede, Belgium | D D I I D D |
| 30.18 | CSW | 9940 | Lisbon, Portugal | S S D D |
| 30.43 | EAQ | 9860 | Madrid, Spain | K D D D D D D D D D D D |
| 31.00 | CQN | 9677 | Macao, Asia | D |
| 31.06 | LRX | 9660 | Buenos Aires, Argentina | D D |
| 31.09 | YNLF | 9650 | Managua, Nicaragua | G G G I |
| 31.09 | CT1AA | 9650 | Lisbon, Portugal | D |
| 31.10 | HH3W | 9645 | Port-au-Prince, Haiti | D |
| 31.14 | I2RO3 | 9635 | Rome, Italy | I I I I I I I I |
| 31.25 | RAN | 9600 | Moscow, U.S.S.R. | D |
| 31.25 | HJ1ABP | 9600 | Cartagena, Colombia | D D D D D D |
| 31.27 | HBL | 9595 | Geneva, Switzerland | SA SA |
| 31.28 | VK6ME | 9590 | Perth, Australia | |
| 31.28 | W3XAU | 9590 | Philadelphia, Pa. | D D D D D D D D |
| 31.28 | VK2ME | 9590 | Sydney, Australia | S S S S S |
| 31.28 | PCJ | 9590 | Huizen, Holland | T AG V |
| 31.28 | HP5J | 9590 | Panama City, Pana. | S S D S D |
| 31.32 | VK3LR | 9580 | Lyndhurst, Australia | XS |
| 31.33 | HJ2ABC | 9575 | Cucuta, Colombia | D D D D D |
| 31.35 | W1XK | 9570 | Millis, Mass. | D D D D D D D D D D D D D D |
| 31.38 | DJA | 9560 | Zeesen, Germany | D D D D |
| 31.40 | TIPG | 9559 | San Jose, C. R. | D D D D D D |
| 31.45 | DJN | 9540 | Zeesen, Germany | D D D D D D D D D |
| 31.48 | W2XAF | 9530 | Schenectady, N. Y. | D D D D |
| 31.48 | LKJ1 | 9530 | Jeloy, Norway | |
| 31.49 | ZBW3 | 9525 | Hong Kong, China | D D SA |
| 31.51 | OAX4J | 9520 | Lima, Peru | D D D D D D |
| 31.55 | GSB | 9510 | Daventry, England | D D D D D D D D |
| 31.55 | HJU | 9510 | Buenaventura, Colom. | C C |
| 31.55 | VK3ME | 9510 | Melbourne, Australia | |
| 31.56 | XEFT | 9505 | Veracruz, Mex. | D D D D D D D |
| 31.58 | PRF5 | 9500 | Rio de Janeiro, Brazil | D D XS XS |
| 31.58 | HJ1ABE | 9500 | Cartagena, Colombia | D X X S S S D XS XS |
| 31.82 | COCH | 9428 | Havana, Cuba | D D D D D D D D D D D D |
| 32.88 | HAT4 | 9125 | Budapest, Hungary | S |
| 33.53 | HCJB | 8948 | Quito, Ecuador | I I I I |
| 34.62 | CO9JQ | 8665 | Camaguey, Cuba | |
| 38.48 | HBP | 7797 | Geneva, Switzerland | SA SA |
| 43.48 | HI3C | 6900 | La Romana, D. R. | D D D |
| 43.99 | XGOX | 6820 | Nanking, China | D D XS |
| 44.14 | HIH | 6796 | San Pedro, D. R. | AC AC S AC |
| 44.71 | TIEP | 6710 | San Jose, Costa Rica | I D D |
| 45.22 | HC2RL | 6635 | Guayaquil, Ecuador | S S S |
| 45.25 | HIT | 6630 | Trujillo, D. R. | XS XS D D |

# WORLD SHORT WAVE TIME-TABLE

*(Continued from the Previous Page)*

**Hours of transmission for the World's Short Wave Broadcast Stations**

| 8 | 9 | 10 | 11 | M | 1 | 2 | 3 | 4 | 5 | 6 | 7 | FILL IN LOCAL TIME | 8 | 9 | 10 | 11 | N | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | GREENWICH MEAN TIME | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 00 |

| Wave-length Meters | Call Letters | Frequency Kc. | City Country | HOURS OF TRANSMISSION | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 45.34 | PRADO | 6618 | Riobamba, Ecuador | | TH | TH | TH | | | | | | | | | | | | | | | | | | | | |
| 45.80 | HI4D | 6550 | Trujillo, D. R. | | | | | | | | | | | | | | XS | XS | XS | | | XS | XS | XS | XS | XS | |
| 46.01 | YV4RA | 6520 | Valencia, Venezuela | D | D | | | | | | | | | | | | D | D | D | | | | D | D | D | D | |
| 46.08 | HIL | 6510 | Trujillo, D. R. | D | I | | | | | | | | | | | | | | | | | | | | D | D | |
| 46.66 | HI1S | 6430 | Puerto Plata, D. R. | | | | | | | | | | | | | | | D | D | | | | | | D | D | |
| 46.85 | YV5RH | 6400 | Caracas, Venezuela | D | D | D | I | I | I | | | | | | | | | | | | | | D | D | D | D | |
| 46.91 | HI8Q | 6395 | Trujillo, D. R. | | | | | | | | | | | | | | D | D | D | | | | D | D | D | D | |
| 47.10 | YV5RF | 6375 | Caracas, Venezuela | D | D | D | | | | | | | | | | | D | D | D | | | | D | D | D | D | |
| 47.12 | YV1RH | 6360 | Maracaibo, Ven. | D | D | D | D | | | | | | | | | | | | | | | | | | | D | |
| 47.24 | HRP1 | 6350 | San Pedro Sula, Honduras | D | D | | | | | | | | | | | | | D | D | | | | | | D | D | |
| 47.54 | HIZ | 6310 | Trujillo, D. R. | I | I | SA | SA | | | | | | | | | | | S | S | S | | I | I | I | I | I | |
| 47.62 | YV4RD | 6300 | Maracay, Venezuela | I | I | I | | | | | | | | | | | | | | | | | | | | | |
| 47.77 | HIG | 6280 | Trujillo, D. R. | XS | XS | | | | | | | | | | | | | | | | | | | | | XS | |
| 47.77 | COHB | 6280 | Sancti Spiritus, Cuba | | D | D | | | | | | | | | | | D | | | | | D | D | | | | |
| 48.05 | HIN | 6243 | Trujillo, D. R. | D | D | | | | | | | | | | | | D | D | | | | | | | | D | |
| 48.11 | HRD | 6235 | La Ceiba, Honduras | XS | XS | XS | | | | | | | | | | | | | | | | S | S | | | | |
| 48.15 | OAX4G | 6230 | Lima, Peru | L | L | L | | | | | | | | | | | | | | | | | | | | L | |
| 48.19 | HJ1ABH | 6225 | Cienaga, Colombia | AM | | | | | | | | | | | | | | | | | | | | | | AM | |
| 48.39 | COKG | 6200 | Santiago, Cuba | D | XS | XS | | S | | | | | | | | | | | | | | | D | | | | |
| 48.50 | HI1A | 6185 | Santiago, D. R. | D | D | I | I | I | | | | | | | | | D | D | D | | | | | | | D | |
| 48.62 | OAX1A | 6170 | Chiclayo, Peru | D | D | D | | D | | | | | | | | | | | | | | | | | | | |
| 48.70 | XEXA | 6160 | Mexico, D. F. Mexico | D | D | D | | | | | | | | | | | | | | | | | | | | D | |
| 48.70 | VPB | 6160 | Colombo, Ceylon | | | | | | | | | XS | XS | XS | XC | V | V | SA | | | | | | | | | |
| 48.70 | CJRO | 6160 | Winnipeg, Canada | D | D | D | D | | | | | | | | | | | | | | | | | D | D | D | |
| 48.72 | YV5RD | 6158 | Caracas, Venezuela | D | D | D | | | | | | | | | | | D | D | D | | | D | D | D | D | D | |
| 48.78 | VE9CL | 6150 | Winnipeg, Canada | | | | SA | SA | | | | | | | | | | | | | | | | | | | |
| 48.78 | HJ2ABA | 6150 | Tunja, Colombia | D | D | | | | | | | | | | | | | | D | | | | | | | D | |
| 48.78 | HJ5ABC | 6150 | Cali, Colombia | | D | D | D | | | | | | | | | | D | S | S | | | | | | | | |
| 48.86 | W8XK | 6140 | Pittsburgh, Pa. | | | | D | D | D | | | | | | | | | | | | | | | | | | |
| 48.88 | CR7AA | 6137 | Lourenzo Marques, A. | | | | | | | D | D | D | | | | | | D | D | D | D | | | | | | |
| 48.94 | LKJ1 | 6130 | Jeloy, Norway | | | | | | | | | | | | | | D | D | D | D | D | D | | | | | |
| 48.94 | VE9HX | 6130 | Halifax, N. S. | D | D | D | | | | | | X | X | X | X | X | X | F | F | SF | D | D | D | D | D | D | |
| 48.94 | COCD | 6130 | Havana, Cuba | D | D | D | D | D | D | | | | | | | | | | | | | | | | | D | |
| 48.96 | HJ3ABX | 6122 | Bogota, Colombia | D | D | D | XS | | | | | | | | XS | XS | D | D | | | | | XS | D | D | D | |
| 49.00 | HJ1ABB | 6120 | Barranquilla, Colom. | D | D | D | | | | | | | | | D | D | | | | | | | D | D | D | | |
| 49.02 | W2XE | 6120 | New York, N. Y. | | D | | | | | | | | | | | | | | | | | | | | | | |
| 49.18 | YTC | 6100 | Belgrade, Yugoslavia | | | | | | D | D | | S | S | S | D | XS | | | | D | D | D | D | D | | | |
| 49.18 | W3XAL | 6100 | Bound Brook, N. J. | D | D | | | | | | | | | | | | | | | | | | | | | | |
| 49.18 | W9XF | 6100 | Chicago, Ill. | | | | XSA | XS | | | | | | | | | | | | | | | | | | | |
| 49.20 | ZTJ (JB) | 6098 | Johannesburg, Africa | D | | | XS | XS | | | XS | D | XS | XS | S | S | D | D | D | D | | | | | | | |
| 49.20 | HJ4ABE | 6097 | Medellin, Colombia | D | D | D | D | | | | | | | | | D | D | | | | | | D | D | D | | |
| 49.26 | ZBW2 | 6090 | Hong Kong, China | D | S | S | D | D | D | | AM | D | D | D | D | D | SA | | | | | | | | | | |
| 49.26 | CRCX | 6090 | Toronto, Canada | | | | SA | | | | | | | | | S | D | P | P | P | P | P | P | P | D | | |
| 49.30 | HJ5ABD | 6085 | Cali, Colombia | XS | XS | XS | | | | | | | | | | | | | | | | | | | | N | |
| 49.31 | HJ3ABF | 6084 | Bogota, Colombia | XS | XS | D | | | | | | | | | | D | | | | | | | | | | XS | |
| 49.32 | VQ7LO | 6083 | Nairobi, Kenya, Afr. | | | | | | | | X | X | E | E | | U | U | U | XC | | | XS | XS | | | | |
| 49.34 | HP5F | 6080 | Colon, Panama | D | D | XS | XS | | | | | | | | | | S | D | XS | | S | S | | | D | | |
| 49.34 | W9XAA | 6080 | Chicago, Ill. | D | D | D | D | | | | | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| 49.34 | ZHJ | 6080 | Penang, S. S. | | | | | | | | | | XS | | | | | | | | | | | | | | |
| 49.40 | OER2 | 6073 | Vienna, Austria | | | | | | | | | | | XS | XS | XS | XS | XS | XS | XS | XS | XS | SA | SA | | | |
| 49.42 | YV1RF | 6070 | Maracaibo, Venez. | D | D | | | | | | | | | | | | P | U | | | | | D | D | D | D | |
| 49.50 | W8XAL | 6060 | Cincinnati, Ohio | D | D | | | | | | XS | XS | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| 49.50 | W3XAU | 6060 | Philadelphia, Pa. | D | D | | | | | | | | | | | | | | | | | | | | | D | |
| 49.50 | OXY | 6060 | Skamlebaek, Denmark | | | | | | | | | | | | | S | S | D | P | P | P | P | P | | | | |
| 49.59 | HJ3ABD | 6050 | Bogota, Colombia | | | | | | | | | | | | | | D | | | | | | D | D | | | |
| 49.59 | HI9B | 6050 | Trujillo, D. R. | D | D | D | | | | | | | | | | | D | | | | | | D | D | | | |
| 49.63 | HJ3ABI | 6045 | Bogota, Colombia | | D | | | | | | | | | | | | | | | | | | | | | | |
| 49.65 | HJ1ABG | 6042 | Barranquilla, Colom. | XS | XS | XS | | SA | | | | | | | | | XS | XS | S | | | | XS | XS | | | |
| 49.67 | YDA | 6040 | Tandjong Priok, Java | | | | | | | D | D | D | D | | | | | | | | | I | | | D | | |
| 49.75 | HP5B | 6030 | Panama City, Panama | D | D | D | | | | | | | | | | | D | | | | | | | | D | D | |
| 49.79 | HJ1ABJ | 6025 | Santa Marta, Colombia | D | D | D | D | | I | | | | | | | | D | | | | | | | | | D | |
| 49.83 | DJC | 6020 | Zeesen, Germany | | | | | | | | | | | | | | D | D | P | P | D | D | | | | | |
| 49.83 | XEUW | 6020 | Veracruz, Mexico | D | D | D | D | D | | | | | D | D | D | D | D | P | P | P | D | D | D | P | D | D | |
| 49.88 | XEWI | 6015 | Mexico, D. F., Mexico | E | XS | XS | XS | | | | | | | | | | | | | | C | | I | | | E | |
| 49.90 | HJ3ABH | 6012 | Bogota, Colombia | D | D | D | I | | | | | | | | | D | P | P | P | P | | S | S | D | D | | |
| 49.92 | COCO | 6010 | Havana, Cuba | | | | SA | SA | | | | | | D | D | D | D | D | | | | D | P | P | | | |
| 49.96 | CFCX | 6005 | Montreal, Can. | D | | | | | | | | | D | D | D | D | D | P | P | | | | SA | | | | |
| 49.96 | HP5K | 6005 | Colon, Panama | D | | | | | | | | P | D | | | | | D | | | | | | D | D | | |
| 49.96 | VE9DN | 6005 | Montreal, Canada | | | | | SA | | | | | | | | | | | | D | | | | | | | |
| 50.00 | XEBT | 6000 | Mexico, D. F., Mexico | D | D | D | D | D | | | | | | | D | D | D | D | D | D | D | D | D | P | P | | |
| 50.00 | RV59 | 6000 | Moscow, U.S.S.R. | | | | | | | | | | | | | | | | | | | | | | | | |
| 50.17 | HIX | 5980 | Trujillo, D. R. | Z | Z | Z | | | | | | S | S | S | | D | D | | | | D | D | | | | | |
| 50.25 | HJN | 5970 | Bogota, Colombia | D | D | D | | | | | | | | | D | | | | | | | | | | | | |
| 50.26 | HVJ | 5969 | Vatican City | | | | | | | | S | | | | | | | | D | | | | | | | | |
| 50.50 | TG2X | 5940 | Guatemala City | XSA | D | SA | SA | | | | | | | | | | | | | | | | | | | | |
| 50.72 | HH2S | 5915 | Port-au-Prince, Haiti | XS | XS | | | | | | | | | | | | | | D | | | | | | | | |
| 50.76 | HRN | 5910 | Tegucigalpa, Hond | D | D | S | S | | | | | | | | | | D | | | S | S | S | P | D | D | | |
| 50.85 | YV3RA | 5900 | Barquisimeto, Venez. | D | D | | | | | | | | | | | | P | | | | | | | P | D | | |
| 51.15 | HIJ | 5865 | San Pedro, D. R. | D | D | | | | | | | | | | | | D | D | D | | | | | D | D | | |
| 51.46 | TIGPH | 5830 | Alma Tica, Costa Rica | D | D | | | | | | | | | | | | P | D | | | | | | P | D | | |
| 51.72 | YV5RC | 5800 | Caracas, Venezuela | D | D | XS | | | | | | | | | S | S | D | D | S | S | S | D | D | D | D | | |
| 51.90 | OAX4D | 5780 | Lima, Peru | | AH | AH | AH | | | | | | | | AM | AM | AM | | | | | | | | | | |

## List of Symbols

A—Thursday, Sunday
B—Saturday, Sunday
C—Monday, Wednesday, Friday
D—Daily
E—Tuesday, Thursday
F—Friday
H—Sunday, Monday, Wednesday, Friday
G—Tuesday, Thursday, Saturday
I—Irregularly
J—Tuesday, Thursday, Friday, Sunday
K—Monday, Friday
L—Wednesday, Saturday
M—Monday
N—Monday, Wednesday, Thursday
O—Monday, Tuesday, Wednesday, Friday
P—Except Tuesday, Wednesday
Q—Sunday, Monday, Tuesday
S—Sunday
SF—Sunday, Friday
T—Tuesday
Th—Thursday
U—Sunday, Monday, Thursday
V—Sunday, Wednesday
W—Wednesday
Z—Tuesday, Friday
AC—Monday, Thursday, Saturday
AG—Tuesday, Sunday
AH—Monday, Wednesday, Saturday
AM—Monday, Thursday
AN—Tuesday, Saturday
Sa—Saturday
X—Except Saturday, Sunday
XC—Except Tuesday, Thursday, Sunday
XS—Except Sunday
XW—Except Wednesday
XSa—Except Saturday


# The DX Corner (Short Waves)

(*Continued from page* 161)

10:50 a.m., 2-2:20 p.m., (Hedgeland).

**I2RO2,** Rome, Italy, 8 p.m., (Wollenschlager).

**Radio Milan,** Italy, 10,070 kc., shifts 6 p.m. to 11,420 kc., (Sakely), 10,400 kc., (Magnuson), 9520 kc., (Hendry), Slogan: "Radio Liberty."

**DJL,** Zeesen, Germany, 15,110 kc., daily 4:50-10:45 p.m., (Alfred), Sunday 6-8 a.m., (Doyle, Hedgeland, Kemp, Pylate), daily 12:01-2 a.m., (Dressler, Ruppert).

**DJO,** Zeesen, Germany, 11,795 kc., 11 a.m., (Alfred), irregular, Nigh).

**DZC,** Zeesen, Germany, 10,290 kc., 8:40 p.m., (Alfred, Lara, Hedgeland).

**DJQ,** Zeesen, Germany, 15,280 kc., 6:05 p.m., (Eder), 12:34 a.m., (Diez, McCartin), daily 4:50-10:45 p.m., (Dressler, Ruppert, Yoshimura).

**DJR,** Zeesen, Germany, 15,340 kc., 6:09 p.m., (Eder), 11 a.m., (Alfred, Diez), 8-9 a.m., 4:55-11 p.m., (Doyle, Lara, McCartin, Hedgeland, Kemp, Dressler), 15,380 kc., (Ruppert).

**DZH,** Zeesen, Germany, 14,460 kc., 7:55 p.m., (Eder, Lara, Hedgeland, Dressler).

**DJD,** Zeesen, Germany, 11,750 kc., 8:27 p.m., (Eder), daily 4:50-10:45 p.m., (Alfred, Gallagher, Prosser, Wacker), 11:40 a.m.-4:40 p.m., (Doyle, Kemp, Ruppert, Coover, Davies, Duncan, Nigh).

**DJE,** Zeesen, Germany, 17,760 kc., daily 12:43 a.m., (Diez), 12:10-5:30 a.m., 5:55-11 a.m., Sunday 11:20 a.m.-12:25 p.m., (Doyle, Dressler, Ruppert).

**DJA,** Zeesen, Germany, 9560 kc., 4:50-10:45 p.m., (Stevens), 9660 kc., (Diez), 12:30-5:30 a.m., (Doyle, Kemp, Pylate, Ruppert).

**DJB,** Zeesen, Germany, 15,200 kc., 8:53 p.m., (Eder), daily 4:50-10:45 p.m., (Alfred, Prosser, McGowan), 1-5:15 a.m., (Stevens, Diez, McCartin, Kemp, Wollenschlager, Dressler, Ruppert, Coover, Duncan), 7:15-7:45 a.m., (Shamleffer).

**DJC,** Zeesen, Germany, 6020 kc., (Gallagher), 12:35-4:30 p.m., (Stevens, Ruppert, Kemp, Ruppert, Duncan).

**DIP,** Zeesen, Germany, 14,410 kc., 4:50-10:45 p.m., (Alfred).

**DZB,** Zeesen, Germany, 10,042 kc., 1011 p.m., (Stabler).

**DZE,** Zeesen, Germany, 12,130 kc., (Gallagher).

## MEXICO HEARD FROM

*This unique card from XEBR was received by Observer Lopez of Cuba in response to his report to the station. Have you earned one of these?*

**DGU,** Nauen, Germany, 9650 kc., (Birnie).

**DJN,** Zeesen, Germany, 9540 kc., 12:43 a.m., (Diez, Eder), 12:10-5 a.m., (Doyle, Ruppert).

**DJP,** Zeesen, Germany, 11,855 kc., 8-9 a.m., 4:53-11 p.m., (Doyle), irregular, (Pylate).

**DJM,** Zeesen, Germany, 6079 kc., (Doyle).

**CSW,** Lisbon, Portugal, 11,400 kc., daily 4-6.30 a.m., (Ruiz), 9940 kc., 7:30 p.m., (Eder), 11,040 kc., (Alfred), 1:50-6:30 p.m., (Smith, Westman, Diez, Lara, Hedgeland Kemp, Chagaris), daily 12-6 p.m., 11,040 kc., 6:30-8 p.m., 9940 kc., (Hartzell, Markuson, Coover, Nigh).

**CT1AA,** Lisbon, Portugal, 9665 kc., Tuesday, Thursday, Saturday, 4-7 p.m., (Alfred, McGowan, Lara), 11,830 kc.,

## HE LISTENS IN JERSEY

*Listener R. W. Hendricks of Jersey City checks other observers' reports as printed in Radio News. And believe us he really checks them.*

## DX CORNER-BROADCAST Waves

THE DX Corner for Broadcast Waves is being omitted this month and next due to the limited interest of readers in DX activities during mid-summer. The department will be resumed in the November issue.

(McCartin, Hedgeland), 9650 kc., (Birnie).

**CT1CT,** Lisbon, Portugal, 9680 kc., Thursday 4-6 p.m., Sunday 7-9 a.m., (McCartin).

**"Radio Catolica,"** Lisbon, Portugal, 5970 kc., 4:40 p.m., (Smith).

**GSA,** Daventry, England, 6050 kc., (Ruppert, Kemp), 6-11 p.m., (Pylate, Walper).

**GSB,** Daventry, England, 9510 kc., 6:20-8:30 p.m., 9-11 p.m., (Alfred, Prasser), 2:43 a.m., (Jaime), 9600 kc., (Diez, Eder, Hedgeland, Kemp, Wollenschlager), 12-3 a.m., (from ann.), (Fallon, Dressler, Partner), daily 12:15-6 p.m., (Markuson, Welper).

**GSC,** Daventry, England, 9580 kc., 9:45 p.m., (Eder, Gallagher), 5-6 p.m., 17,790 kc., (Prasser), 9-11 p.m., (Fallon, Wacker, Doyle, Hedgeland, Kemp), irregular, (Pylate, Markuson, Jordan, Coover, Welper, Nigh).

**GSD,** Daventry, England, 11,750 kc., 10:55 p.m., (Eder), 6:20-8:30 p.m., 9-11 p.m., (Alfred, Gallagher, Fallon, Diez, Wocker), 12:30-3:45 p.m., (Doyle, Hedgeland), 12-3 a.m., (from ann.), (Fallon, Dressler, Partner, Markuson, Coover, McGowan, Welper, Duncan).

**GSF,** Daventry, England, 15,140 kc., (Alfred), 9-11 p.m., (Fallon, Diez, Eder), 4-6 a.m., (Doyle, Hedgeland, Pylate, Oglesby, Dressler, Coover, Davies, Yoshimura, Duncan).

**GSG,** Daventry, England, 17,790 kc., 6:45-8:30 a.m., (Dressler, Patrick), 17,857 kc., 12:40 a.m., (Diez), 2:30-4:30 a.m., 10-12-10 a.m., (Doyle, Hedgeland), 12-3 a.m., (from ann.), (Fallon, Dressler, Partner, Welper, Shamleffer).

**GSH,** Daventry, England, 21,470 kc., 6:45-8:30 a.m., 9:15-11.30 a.m., (Dressler, Doyle, Hedgeland, Welper).

**GSI,** Daventry, England, 15,260 kc., 9:49 p.m., (Eder), 9-11 p.m., (Fallon, Hedgeland, Davies, Welper).

**GSJ,** Daventry, England, 71,530 kc., 9:15-11:30 a.m., (Dressler, Hedgeland, Welper).

**GSP,** Daventry, England, 15,310 kc., 7:44 p.m., (Eder), 6:20-8:30 p.m., 9-11 p.m., (Alfred, Fallon, Hedgeland, Dressler, Welper).

**GSO,** Daventry, England, 15,180 kc., 6:20-8:30 p.m., 9-11 p.m., (Alfred, Fallon, Diez, Eder, Hedgeland, Dressler, Partner, Davies, Welper.)

**GST,** London, England, 21,550 kc., irregular during Coronation, (Partner).

**HBP,** Geneva, Switzerland, 7797 kc., Saturday 5:30-6:30 p.m., (Fallon, Smith, McGowan, Westman, Oglesby), same address as HBL, (Mogunsen, Birnie, Dressler).

**HBQ,** Geneva, Switzerland, 6675 kc., same address as HBL, (Magnuson).

**HB9B,** Basle, Switzerland, 14,236 kc., with special broadcast, (Skinner).

**HBH,** Geneva, Switzerland, 18,480 kc., same address as HBL, (Magnuson).

**HBF,** Geneva, Switzerland, 18,450 kc., same address as HBL, (Magnuson)

(*Turn to page* 174)

# THE SERVICE BENCH

(*Continued from page* 141)

This tool can be worked under almost any lid, and between any tube base and socket. In the latter instance, the leverage is excellent and a bit of gentle motion in any direction will pop the tube right out! Good for vibrators too—and tubes in any compact radio set."—Harry Weir, Oneonta, N. Y.

## Belmont and Philco

James L. Hoard, of Providence, R. I., sends us the latest chapters from his service scrapbook: "The trouble with most of the Belmont 675s, when the complaint is non-operation, can usually be traced to an open section in the bleeder resistor—the 13,000-ohm section.

"Quite a bit can be done to improve the operation of the very popular Philco 20A receiver. The tone can be considerably bettered by replacing the speaker cone of limited response with a new Philco cone or its equivalent. At the same time, a dial-light can be added which was lacking on the older models. A pilot light (2.5 volts), socket, bracket and a short length of twisted cord are all that is required. The bracket can be mounted on the spring which maintains positive contact on the gang-condenser rotor shaft. The cord is connected within the chassis to the heater contacts of a 24A—near the front of the chassis.

"It is a good idea to install a tone control at the same time."

## SERVICE NOTES

National Union has designed an advertising electric clock for distribution to radio servicemen through the regular jobber channels. The clock is shown in Figure 8—and its double function is to *tell time* and *sell radio service*. It is described as a "permanent high-spot advertising fixture, equipped for brilliant illumination as a night display, with equal attractiveness in day-time use." The face glass size is 16 inches by 24 inches, framed in a one-inch two-tone black and silver border. The face design is in modern style—five colors and a silver mirror. The copy which sells radio service has been developed by a patented process to produce a neon light effect when illuminated and *it can be seen a block away!* The clock is equipped with a switch for light control so that the light can be extinguished without affecting the operation of the clock movement. The clock is driven with a Hammond heavy-duty motor.


FIGURE 8
*An advertising clock—a bit of dealer cooperation on the part of National Union.*

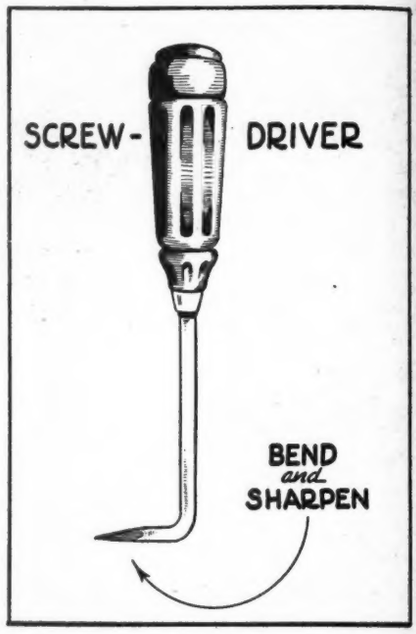



FIGURE 7
*A tool that will take most of the "cussing" out of auto-radio servicing.*

## Organized Auto Radio Service

Recognition of auto-radio servicing as a specialty has resulted in the organization of the "United Auto Radio Service" in the New York City area, which may well serve as a model for similar co-operative endeavors in other parts of the country. As the secretary writes us—"Auto radio is now an established branch of radio in general and in consequence the demand for and the sale of car radios has created a serious problem, namely, the proper installation and servicing of these instruments. This work requires special knowledge of both automobiles and radios, and also special equipment for installing, testing and repairing the same. The large majority of automobile sales and service stations not being equipped for this work have been forced to turn elsewhere for help with such work. Similarly, the customer, in many cases, found it inconvenient to return to his automobile dealer for radio service and in many instances hesitated to purchase a radio from him.

"With this appreciated need for efficient, universal Service Stations in mind, the United Auto Radio Service was formed with member stations throughout the metropolitan area. Under its plan, any new auto-radio installed by a member station can be serviced by any other member station, free-of-charge, during the 90-day warranty period, thus assuring both the dealer and the customer a prompt, efficient and convenient service. This plan is meeting with widespread acclaim."

## Next Month

**Complete dope on an electronic mixer for P.A. and amateur work.**

RCA ALL THE WAY

# RCA Radio News

RCA Manufacturing Company, Inc. • Camden, New Jersey
A Service of the Radio Corporation of America

EVERYTHING IN RADIO-MICROPHONE TO LOUDSPEAKER

To the consumer, RCA means high quality performance at low cost...To the radio man, RCA means easier selling, higher profits

# TUNING 50 TIMES EASIER

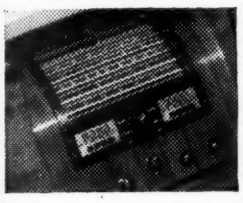
## *New RCA Victor Overseas Dial Is Short Wave Sensation*

### Electric Tuning Also Scores. Push a Button—There's Your Station!

### Remote Tuning Achieved by Fool-Proof Armchair Control Device

Short wave fans are buzzing about the new 1938 RCA Victor Overseas Dial, a radical departure which makes short wave tuning easier than domestic.

The individual band scales representing the popular international entertainment bands are each 9½ inches long. This compares with the ¼-inch segments on the usual short wave dials. By actual measurement the crowded short wave stations are spread fifty times wider.



Each wave band lights up only when in use. Foreign stations appear by name on the dial scales.

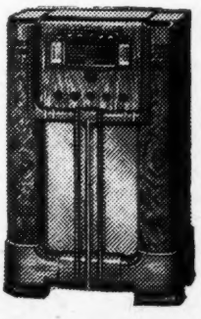
The Overseas Dial is the leader of four improved dials in the 1938 RCA Victors. All are larger, easier to read.

Another major RCA Victor improvement is Electric Tuning—the first that's truly automatic. Push a button—there's your station. It's as simple as that. Gets any eight stations, foreign or domestic.

Electric Tuning may be extended to your easy chair with Armchair Control which may also be placed anywhere, in any room, that is convenient.

A fourth big new RCA Victor feature is the Sonic-Arc Magic Voice, which applies the principle of a band shell to bring finer tone, free from boomy reverberation.

RCA Victor Dealers are now demonstrating the 39 new 1938 models, ranging in price from $20 up. All models incorporate a generous number of RCA Victor's 55 great extra-value features.



RCA Victor Model 811K, featuring new Straight-Line Dial and Electric Tuning, 11 tubes, new Sonic-Arc Magic Voice, Magic Brain, Magic Eye, RCA Metal Tubes, covers standard broadcast band and 49, 31, 25, and 19, 16 and 13 meter bands of international entertainment. Armchair Tuning available at slight extra cost. $150. (f.o.b.) Camden, N. J., subject to change without notice.

## Fall Radiotron Check-Up Gets Under Way

### Gives Old Sets New Life... RCA Offers Outstanding Selling Helps

Window Display scheduled for delivery in September. See your distributor about yours.

To alert service men and dealers, September means the RCA Radiotron Check-Up Plan. Experience proves this plan gives radio dealers and service men a fine opportunity to make money.

The RCA Radiotron Check-Up puts new life in radios that are wobbling on their last legs. It's good for them. Makes them perform like they did when new. And it's a service most radio owners are glad to pay for—because the job is so satisfactory and the cost is so small.

To dealers and service men the Check-Up means more service jobs—at a minimum of $1.50 a job. It means not only a chance to sell tubes, but by providing entry into the various homes in the community, an opportunity for the sale of many other electrical products.

The RCA Radiotron Check-Up is easy to sell: first, because it's an excellent service; second, because RCA backs it up with selling helps and advertising that does a job.

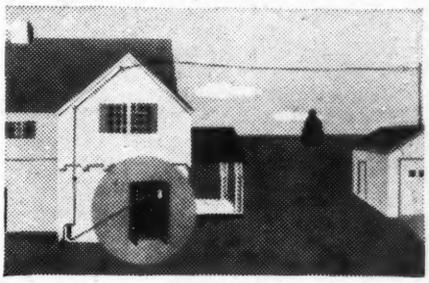
The Saturday Evening Post and Collier's will carry timely ads on Check-Up every other week. Real selling commercials will be plugged on a full hour radio program every Sunday. Besides these, there are scores of store helps available to you, plus tested direct mail pieces, such as letters and postcards, the Listening Ear, auto door hangers, auto radio check-up letters—every one of which packs a real selling punch. See your distributor.

Get behind the RCA Radiotron Fall Check-Up campaign—and your cash register will bang out a merry tune. Full details from your jobber.

Ask your RCA Parts Distributor for new RCA Parts Catalog and data about Magic Wave Antenna System.

## New Antenna Cuts Noise

### RCA Magic Wave Antenna System Operates up to 16 Outlets on One Antenna



No improvement in radio reception is more universally desired than the elimination or the reduction of noise. RCA now offers a product that does the job! The new Magic Wave Antenna System provides noise reduction on both standard and international short wave bands from 530 to 23,000 kcs. This is due to use of a new magnetite core transformer and the transmission line.

**Operates 16 Outlets at One Time**

The Magic Wave Antenna will operate up to 16 outlets on one antenna. This is possible through the use of additional special distribution and set coupling transformers.

The length of the antenna proper may be varied between 20 and 120 feet, making for ease of installation—yet retaining excellent efficiency. The transmission line is also variable to any desired length, again with a minimum of losses. No doublets or critical lengths required. Adaptable to existing installations.

**Can Be Used for Vertical Installations**

By using several lengths of ordinary iron pipe and reduction couplings, a high efficiency vertical antenna may be used in conjunction with the RCA Magic Wave System. By using stock number 12429, Submarine Cable, the transmission line may be buried and all unsightly wiring eliminated. Such an installation can be conveniently located remote from interference.

The new RCA Magic Wave Antenna System consists of one antenna coupling transformer and one receiver coupling transformer. Each coupling unit has two transformers in which magnetite cores are used. One of the transformers responds with greater efficiency on the standard broadcast band. The other on the international short wave band.

The Magic Wave Antenna System, stock 9812, lists at $6.95, assembled in one complete unit ready for installation.

# RADIO PHYSICS COURSE

ALFRED A. GHIRARDI

## Lesson 65. Electric Currents

IT must be evident to the student that the two quantities which we deal with most in electrical radio work are the *current* or "rate of flow" of electrons through the circuit, and the *voltage* or "electrical force" which causes the drift of electrons. The "electrical power" or *watts* may also be considered. It is necessary for us to be able to accurately measure these quantities, in order to design, build and test electrical and radio equipment. Since we cannot see or hear an electric current flowing through a circuit, we must employ one or more of its effects which we *can* observe, for its measurement.

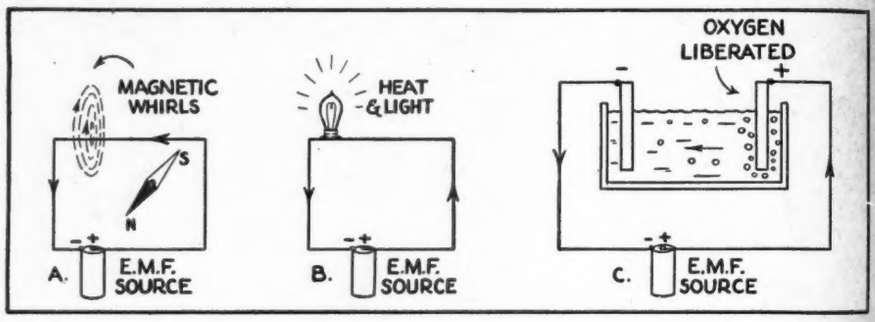



*Figure 1. Magnetic, heating, and electrochemical effects of an electric current.*

First, current flowing through a circuit, always produces around it an associated magnetic force or field whose strength is proportional to the rate of current or electron flow (amperes) through it. This is known as the *magnetic effect*, and is illustrated at (A) of Figure 1. Second, a current flowing against the resistance of a circuit always produces heat, proportional to the square of the current. This is the *heating effect*, as shown at (B). Third, if current is sent through an acid or salt solution between two conducting plates, electrolytic action will take place, the solution will be dissociated chemically and metal will be plated out on one of the plates. This is known as the *electro-chemical effect* and is illustrated at (C).

Theoretically, any of the three effects mentioned and described above could be employed for the measurement of electric current and e. m. f. simply by measuring the intensity of the effect produced by the passage of the current to be measured. Practically, however, the magnetic effect is employed most frequently, in what are known as the *magnetic type* electrical measuring instruments, and the heating effect is used in the older *hot wire* instruments. The electro-chemical effect is not used for current measurement in practical work.

## The Radio Workshop

(*Continued from page* 156)

inch aluminum rod approximately 48 inches long. It is set in a round wooden block about two inches in diameter by five inches long. A hole is drilled through the top of this block about four inches deep; also one at the side as shown. The bolt in this latter hole is passed through the block and the rod and the connection from the bolt is made to the frame of the car. For fastening the antenna assembly to the bumper rod it is only necessary to clamp the boards each side of the bumper-rod and fasten by means of the carriage bolts and nuts.

The feeder connection to the transmitter is made 14 inches from the bottom end of the aerial rod. My transmitter is installed in the rear of the car at the point nearest

HARRY VIERLING,
New York, N. Y.

### New Yugoslavian Station

Zagreb, Yugoslovia—It is planned to construct a new radio station at Split which will serve for broadcasting as well as a commercial station. The proposed power is 20 kilowatts and the cost of construction has been estimated at $136,300.

## The Radio Beginner

(*Continued from page* 155)

power supply chassis. The center-tap connects to chassis. This was found necessary to eliminate hum on certain stations. These condensers will cause the chassis to be "hot" when the plug is in and it is not grounded—even if the switch is off. Always connect the ground first, then put in the plug; also pull out the plug before disconnecting ground if shocks are to be avoided.

The following alignment procedure can be followed by those who have a calibrated serviceman's oscillator or the oscillator described in a previous installment. The recommended output device is a milliammeter of 0-10 ma. range, connected in series with the plate lead of either the r.f. or the i.f. amplifier. When this method of output measuring is used, the signal can be either modulated or unmodulated.

Assuming the oscillator was calibrated, set for 456 kc. (23.5 dial reading on our model). Clip a lead to the insulated part of the grid lead of the i.f. tube and bring it near the oscillator. Stop the set oscillator by shorting its tuning condenser. Now adjust the condensers of the last i.f. transformer until the test signal is heard. If difficulty is had, clip a lead from the grid of the test oscillator to the grid of the i.f. tube, disconnecting the regular grid

lead. Then adjust for minimum reading of the milliammeter.

Next clip a lead onto the insulated portion of the grid lead of the 6A8. This lead will then serve as antenna. Do not connect it to the test oscillator, just bring it near to it. Now adjust the first i.f. transformer for maximum response. Then go over both transformers again, always striving for the minimum reading on the milliammeter.

Remove the short circuit on the oscillator in the receiver and connect a 3-foot lead to the antenna post. If the dial is adjusted so it reads zero for a completely unmeshed condenser, and 100 for completely meshed, set the dial to 23. Set the test oscillator to 1400 kc. (14 on the dial of our model), adjust the trimmers on the gang condenser.

Set the test oscillator to 600 kc. (83 on our model). Tune in the signal on the receiver and adjust the padder C19 for maximum reception. Here it is necessary to "rock" the gang condenser; that is, vary the gang condenser slightly either way, at the same time varying C19 for maximum reception. One point on the dial will be found where reception is best. This is the point where the r.f. and mixer stage are tuned to exactly 600 kc., and the oscillator, of course, to 1056 kc. This last adjustment affects the one at 1400 kc. somewhat, so it is best to go over them once more. These adjustments must be made carefully; when the receiver produces a squeal at each station, the adjustment of C19 is incorrect or the i.f. amplifier is not aligned at the right frequency.

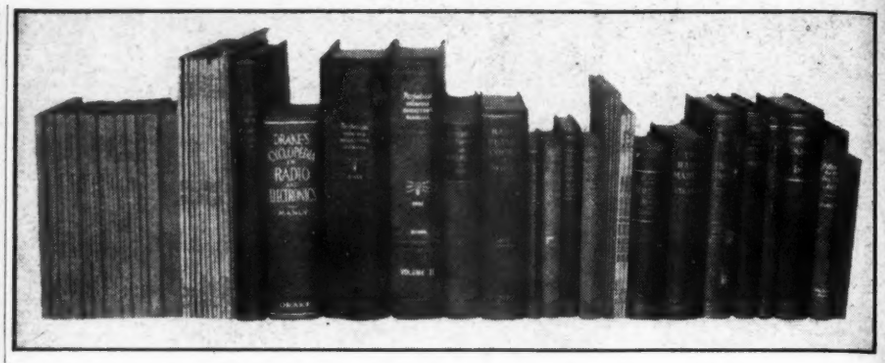
## List of Parts

(Components which also were used in the t.r.f tuner).

C1, C2, C3—Meissner 3-gang variable condenser, type 15122, .00035 mfd.
C4, C5, C6, C7, C8, C9, C10—Cornell Dubilier, type BA-4P1 tubular paper condensers, 0.1 mfd., 400 volts.
C11—Cornell-Dubilier, type 2W-5T25 mica condenser, .00025 mfd.
C13—Cornell Dubilier, type DT-4S2 tubular paper condenser, 0.02 mfd., 400 volts.
C14, C15—Cornell-Dubilier, type DT-4S1 tubular paper condensers, 0.01 mid. 400 volts.
L1—Meissner, type 1085 low impedance antenna coil.
L2—Meissner, type 1084 low impedance r.f. coil.
R1—Electrad, type 280 potentiometer, 25000 ohms.
R2, R3—500 ohms.
R4, R5—0.1 megohms.
R6, R7—1000 ohms.
R8—0.25 megohm.
R10—1 megohm.
R11, R12—0.1 megohm
} IRC carbon resistors ½ watt.
1 National, type C dual-range velvet-vernier dial with illuminator and 6.3 volt pilot light.
3 octal sockets, wafer type, mounting centers 1½ inch
1 ICA chassis, type 1531, cadmium plated steel, 11x7½x2½ with large holes punched.
1 Aluminum panel, 4½x6 inches, 1/16 inch thick.
1 ICA terminal strip, type 2419, marked A+G
1 ICA terminal strip, type 2418, marked "Output"
6 insulated terminal strips, two terminals each.
2 insulated terminal strips, three terminals each.
1 shaft reducer, ⅜ inch hole, ¼ inch shaft.
2 angle brackets.
2 feet 5-wire battery cable.
1 5-prong plug.
1 knob for sensitivity control.
2 grid clips for metal tubes.
2 6K7 tubes.
1 6C5 tube.

(New parts—not used before).

C16, C17, C20—Cornell-Dubilier, type DT-4P1 tubular paper condensers, 0.1 mfd., 400 volts.
C18—Cornell-Dubilier, type 5W-5T1 mica condenser, 0.0001 mfd.
C19—Meissner Junior Trimmer, type No. D2500, 110-500 mfd.
3 Hammarlund trimmer condensers, type MEX-30.
2 Cornell-Dubilier, type DT-4P1 tubular paper condensers, 0.1 mfd., 400 volts.
L4—Meissner, type 4243 oscillator coil for supers with 456 kc., i.f.
L5—Meissner, type 5712 i.f. transformer.
L6—Meissner, type 5714 i.f. transformer.
R13—20,000 ohms.
R14—25,000 ohms.
R15—50,000 ohms.
R16—1000 ohms.
} IRC carbon resistors ½ watt
1 octal socket, wafer type, mounting centers 1 inch.
1 6A8 tube.
1 grid clip for metal tube.



# THE TECHNICAL REVIEW

CONDUCTED BY THE TECHNICAL EDITOR

*The Causes and Elimination of Radio Interference,* by J. E. Foster; C. W. Nelson Co., 1937. The author of this book has been tracking down interference for the Long Island Lighting Co., in Roslyn, N. Y. The text is written for engineers, servicemen, employees of power companies and the general public. In simple words it explains the reasons for different types of interference and the methods used for locating the cause. By far the greater part of the book deals with locating faults on the power lines themselves. Other chapters discuss the interference in the home and how it should be located. Although some of the methods used are available only to power company employees (cutting out certain houses and streets), the book should be useful to others. Servicemen can also learn that the alibi of a "leaky transformer" is an unfortunate choice and that a new set of tubes does not stop interference. Believe it or not, some do not seem to know it. Chapter Headings: I. Fundamental Principles of Radio; II. The Cause of Radio Interference in the Average Home; III. Radio Interference Caused by Electric Light and Power Lines; IV. Radio Interference Caused by 2300 and 4400 Volts Distribution (Primary) Feeders; V. Radio Interference Caused by High Tension Transmission Feeders; VI. Radio Interference Caused by Street Lighting Circuits; VII. Use of Interference Locator in Underground Cable Work; VIII. The Relation Between Electric Light and Power Companies and Radio Dealers and Servicemen.

*Radio Advertising in Australia,* by W. A. McNair; Angus and Robertson Ltd., Sydney; 1937. A prospective advertiser generally wishes to know, how radio advertising compares with other forms of advertising in cost; how large is the radio audience, what income classes do they represent, what is the best station to use, what is the best time, what type of program is most suitable and what is the most effective way of presenting the advertising announcements. Although not all of these questions can be answered accurately, the book describes what has been done along this line in Australia and in America and gives statistical results of surveys to determine the size and habits and preferences of audiences in Australia. This is quite a sizeable book—461 pages—and gives quite a detailed treatment of all the aspects involved. It is divided into four parts. The first part deals with the principles of advertising. It sketches the benefits and abuses of advertising. It sketches the benefits and abuses of advertising, its organization, development of technique, and the selection of media. The second part describes the broadcasting systems in use in different countries, compares radio with other types of advertising and includes a chapter on the effective use of radio. In Part III the different types of surveys are described. These surveys are made by mail, telephone or personal call to a selected group of listeners which are considered a cross section of the entire audience. Measuring the total audience, the distribution by days and hours and the preferences. The fourth part of the book is a summation of conclusions.

Radio listeners and station owners may find the volume worth reading. We would suggest that the questionnaires are designed only to reveal the listening habits of the public under existing conditions while these may simply be the choice of the lesser evil. It does not disclose possibility of success in an entirely new direction. This is best illustrated by the rise of station WQXR in New York which restricted itself to symphonic programs between 5 and 8 p.m.—hours which were considered unfavorably by the larger stations. The wording of the questionnaire would not have permitted the listener to express his desire for such a program at such a time.

*Television,* by G. R. M. Garratt (assisted by G. Parr) published by the British Government (His Majesty's Stationery Office) in conjunction with the current television exhibition at the Science Museum, South Kensington. The book's 63 pages, divided into nine chapters, contain a summary of all television progress from the Becquerel discovery of the electro-chemical effect of light in 1839 to the public-participating high-definition service in London today. American, as well as British developments are reported and the book contains many interesting diagrams and especially valuable bibliographies.

In the introduction, E. E. B. Mackintosh, director of the Science Museum states: "The technique of television, though related in some respects to that of the transmission and reception of sound, is far more complex." Now, doesn't that sentence sound like the remarks of American radio executives who try to explain the delay in introducing television here? Ah, but wait! Mr. Mackintosh has more to say: "Nevertheless, its general principles are such as can be understood by the layman in scientific matters."

The American reader of the British book can't help but wonder why television remains on the laboratory shelf in the U. S. A. while it's forging ahead *publicly* in England. *Television* can be purchased at the British Library of Information, 270 Madison Avenue, New York.

*Not to Be Broadcast,* by Ruth Brindze (Vanguard Press), attacks radio monopolies and stresses the need for a freer air. The whole structure of American commercial broadcasting passes before her critical eye

and she's not too enthusiastic, one must say, about any part of it. She uses case histories (usually bits from publications and "the records" to back up her argument) but they are meager summaries and while they may often prove her point, the reader feels he should get fuller presentations of *both sides* before being convinced.

It seems as if Miss Brindze didn't intend missing a bet in her "inside stories." But as an expose the book misses fire. Adding all of the reported plaints together, they represent such a small fraction of the total American broadcasting hours that they fail to reveal mass shortcomings. True, there are many singled-out things in American radio that can stand correcting. But why shake a bottle of port wine before decantering? It spoils the taste. Rather, let the small bit of sediment sink to the bottom of the bottle and enjoy the clear wine. In *Not to Be Broadcast,* the sediment of radio is so shaken as to make most of broadcasting seem cloudy.

There is a definite reader "letdown" when, in the last chapter headed "Solutions?" Miss Brindze leads off with: "There is no easy solution for the problems created by radio. They represent in highly concentrated form the social and economic dilemma of America."

## Review of Articles Appearing in the June 1937 issue of the Proceedings of the Institute of Radio Engineers

*The Shunt-Excited Antenna,* by J. F. Morrison and P. H. Smith. The paper describes an arrangement for exciting a vertical broadcast antenna with the base grounded. Construction economy results through the elimination of the base insulator, the tower lighting chokes and the usual lightning protective devices.

*Television in Great Britain,* by Noel Ashbridge. The development of television in Great Britain is treated in this paper and a short historical background is given tracing the development of television in Great Britain from 1929, when the British Broadcasting Corporation first gave the Baird Television Company facilities for experimental transmission of low definition television from an ordinary broadcast station.

*Ground Systems as a Factor in Antenna Efficiency,* by G. H. Brown, R. F. Lewis, and J. Epstein. Theoretical considerations concerning the losses in ground systems are advanced. These considerations indicate the feasibility of antennas much less than a quarter wave length tall, for low power broadcast use. The desirability of large ground systems is also indicated. Experimental data are given which show that an eighth-wave antenna is practically as efficient as a quarter-wave antenna.

## Review of Contemporary Literature

**THE following are reviews of articles appearing in recent issues of technical magazines; the name of the magazine and its date are given after the title of each article. Copies of these articles are not included under the "Free Booklets"—they are available from your bookdealer or direct from the publishers. Addresses of publishers will be furnished on request.**

*Television Terminology,* by D. G. Fink, Electronics, June 1937. The technique of television has brought a new host of technical and slang terms which are here explained. Here are some: dolly, windshield, gobos, womp, broads, tilt-and-bend compensator, etc. "Business" is used for anything not yet named.

*Universal Amplification Charts,* by F. E. Terman, Electronics, June 1937. A set of curves which permit the prediction of resistance-coupled and transformer-coupled amplifier performance.

*Distortion in High-Fidelity Audio Amplifiers,* by Reuben Lee, Radio Engineering, June 1937. A discussion of distortion in power amplifiers caused by variation of the load impedance connected to the power tube.

*A High-Frequency Voltage Standard,* by A. L. Arguimbau, the General Radio Experimenter, June 1937. A thermo couple to measure the current through a standard resistor forms this voltage standard.

*Audio-Frequency Transformers,* by E. T. Wrathall, The Wireless Engineer. The object of this article is to review the principles of audio-frequency transformers, to apply these principles to simple and practical methods of design, and finally to describe the essential tests which should be applied to a finished transformer.

*A Fundamental-Reinforced Harmonic-Generating Circuit,* by John L. Reinartz, QST, July 1937. Describing a means of obtaining full efficiency of the frequency multiplier regardless of which harmonic is used. This is accomplished by feed-back across the multiplier stage.

*Hints on High Fidelity,* Aerovox Research Worker, May 1937. A collection of points, often overlooked, which are essential in obtaining high fidelity.

## FREE BULLETINS

### Free Accessory Folder

The American Phenolic Corp. has just brought out a new catalog describing their socket-plug assemblies. It lists connectors and cable accessories for microphones and speakers and their complete line of "Steatite" sockets. Copies of the catalog are free for the asking. Send your request to RADIO NEWS, 461 Eighth Avenue, New York City.

### Free Transformer Catalog For Servicemen and Amateurs

This new catalog of the Kenyon Transformer Company describes in detail their "T" line of audio and power components for amateur transmitters and P. A. systems. This catalog is obtainable without charge from RADIO NEWS, 461 Eighth Avenue, New York City

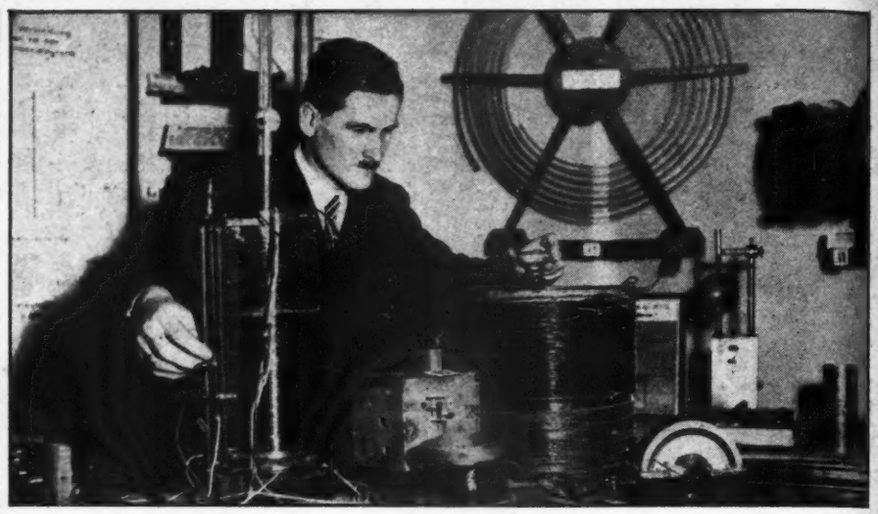

### Large 16-page Catalog

Illustrated above is the new "Inter-World" catalog offered free to servicemen, dealers, and "Hams." The book describes their P. A. systems, transmitters, receivers, testing equipment, and numerous other products. Copies are obtainable free of charge from RADIO NEWS, 461 Eighth Avenue, New York City.
nue, New York City.

### RADIO NEWS Booklet Offers Repeated

FOR the benefit of our readers, we are repeating a list of valuable, FREE technical booklets and manufacturers' catalog offers, which were described in detail in the April, May, June, July and August 1937 issues. The majority of

(*Turn to page* 173)



# QRD? QRD? QRD?

CONDUCTED BY GY

**ANOTHER great stride in long distance communication was made when RMCA and BELLTEL agreed to jointly participate in radio-tel service with vessels in the coastal and inland waters of the USA, as well as those in the transocean trade. The new angle is that either one or the other may house equipment and personnel in either of their regular stations.**

RMCA will install telephone equipment on more ships and will apply for permits from the FCC to construct marine telephone coastal stations on the Great Lakes and operate a service between ship and shore connecting with the telephone landline. Also, RMCA has contracted with the Matson Navco for the installation of telephone apparatus on their Lurline, Malolo, Mariposa and Monterey. They will not only be in constant telephone communication with other ships but also with the North American continent, the Hawaiian Islands and Australian Stations. Again we say "QRD IMI."

It is really wonderful, the progress made in ship radio. Look at our heading for this month and note the apparatus, recently discovered in Prof. Carl Unger's Lab. at Pöllen, near Vienna. Only 25 years ago he used this equipment to receive the S.S. Titanic's *SOS*!

The scene of action for radiops has now shifted from the sunkist shores of the West Coast to the noisy waterfront of the Atlantic. And now that the sphere of unionization of radiops has encompassed a political angle, things are popping. In the past, the greatest difficulty for the ARTA was to get publicity. Today, the full glaring rays of a million candle-power public are turned upon them. Because they have necessarily become connected in a cooperative manner with seaman organizations, indirectly they are continuously being embroiled in action of one sort or another. And today they have become affiliated with the Committee for Industrial Organization, better known as the CIO. Whereas in the past their only thought was in the direction of organizing radiops, today communication workers in other fields, such as telegraphists in Postal and WU, have gained their attention. Will the radiop, therefore, lose his identity and autonomy, or is this another step toward "goose-step" cooperative unionism?

But the former one and only radiop organization, ARTA, today has a rival for the affections of the radiop. The CTU Maritime Division, piloted by Frank Powers and such men as Cosmas, Kleinklaus, Freddie Ulrich and, perhaps in the future, Karl Baarslag, has thrown its glove into the atmospherics. This organization is affiliated with the American Federation of Labor. The question now arises—"Is this to be a fight between the ARTA and the CTU Maritime Division to gain radiops greater recognition and better conditions? Or is it just a fight between the AFL and CIO?" Humorously, one may compare the radiop in this situation to the girl whose affections are being sought by two rivals. Although she may believe both are equally worthy of her love, she cannot make up her mind who shall be the lucky one. In desperation, she sometimes picks a third who happened to come around, unnoticed by the two battlers. Well, time will tell.

According to the CTU MarDiv, they have signed up closed-shop agreements with seven steamship companies, amongst whom are the Merchants and Miners TransCo. In a letter to all radiops in this fleet, Mr. R. T. Merrill, General Super, says "Upon satisfactory evidence that this organization represented the radio personnel of our fleet, I have entered into an agreement with the CTU covering wages and working conditions in our fleet. I am confident that it will be to our mutual advantage under present conditions to work through this organization and it is a pleasure to me to have concluded this agreement with them.

On the other hand, according to ARTA, they have increased their membership 100%, signed up five new steamship closed shop agreements, and established twelve new locals. Which, taken by and large, is nothing to sneer at. Also, for the first time in their tumultuous life, radiops are being hired directly through their own union halls on the Atlantic and Gulf Coasts. But will personalities enter into the placement of ops as was so clearly manifest during the hiring in the RMCA "Buzzer" rooms? We hope not!

Willard Bliss, who has been bouncing around hither and thither, from one job to another, abused and villified until the poor fellow has had to pinch himself to make sure he isn't on board ship, trying to

support a rocking Telefunken spark threatening to kiss him good-bye under the urging of a hurricane-mad galloping tub, is now being proposed for the imposing title of National Communications Director. If our readers will remember, Bliss was National Secretary-Treasurer of the ARTA, but more recently has been organizer of New York Postal Local of the CTU. We hope Brother Willard will get another pair of glasses if elected.

One for the record: "After 20 years of standing watches around the clock. . . . I would like to begin to enjoy something that would permit me to forget the everlasting thought of having to make a certain time limit . . . not to miss a watch or be late for one. I would like to know that in the system for which I work, a better position . . . be given to the employee having the longest seniority and the best qualifications . . . I would also like to see that such labor policies (of the company's) be not abrogated at the first fall of the Stock Market. Certainty that Sunday and holiday work would be compensated by extra money . . . I should like to rest two days in seven and know that I would not be called the day before my two days off to work for John Whoosis because he couldn't come in . . . and that by my own efforts I could creep slowly up the hill of accomplishment would be a sort of earthly paradise." Very well done, "Anonymous." You are not alone in your ambitions.

Our Westcoaster reports: Shipping is very good. Ships are being drydocked and placed back in operation. The Marine situation is vastly improved with wages averaging 30 to 40% higher than '27 or '28. The West Coast brothers continue to yell "scab" at the East Coast brethren who take Copeland books or certificates. Yet they want the SS companies to obey the Wagner act. Obedience to law affects both sides. It says "collective bargaining." Remember?

On this Coast third class men are still operating Airways. Listening to some of the young fellers just starting out on the 600-meter band shows radio schools are still doing business and placing many graduates. Uncle Sam has been hiring more radiospectors so's to watch the lads. Airways are hiring more ops. Wages are still low but expect same to rise shortly. Legislation is pending stating radiop must be over 21 years of age to be a licensed operator. Good idea, but the amateurs are fighting it. Speaking of overtime pay, if members of the crew and officers get overtime, why shouldn't radiops get same? Getting "QTE" in the wee hours surely deserves it.

And now, me hearties, there is the situation. CTU MarDiv and ARTA. Two organizations with but a single thought: the unionizing of the rank and file radiop for greater recognition, more wages and better working conditions. Which side of the fence to fall on? Or is the question: AFL or CIO? You will be harangued by organizers from both unions. Before making a decision, it is our suggestion to first go into conference with yourself. And so with best wishes for a clear head, 73, ge . . . . . GY.

## The Technical Review

(*Continued from page* 171)

these booklets are still available to all readers. Simply ask for them by their code designations and send your request to RADIO NEWS, 461 Eighth Avenue, New York, N. Y. The literature marked with an asterisk is available only to bonafide servicemen, dealers, and engineers. In applying for these folders it is necessary to send in your request on your card or letterhead. If you are an amateur give call letters. The list follows:

**A11**—56 page Catalog. Montgomery Ward & Co.
**A12**—Parts Catalog. Hammarlund Mfg. Co.
**A13**—McGraw-Hill Publishing Co., General catalog listing radio text books.
**My1**—Service booklet, Readrite Meter Works.
**My2**—Folder on small motor-driven "Handee" tool. Chicago Wheel & Mfg. Co.
**My3**—Resistor catalog. International Resistance Co.
**My5**—D. Van Nostrand Company's general book catalog.
**My6**—Volume control guide. Central Radio Laboratory.
**My8**—Condenser catalog. Solar Manufacturing Company.
**Je1**—Circulars on power equipment. Pioneer Gen-E-Motor Corp.
**Je2**—Parts Catalog. Allied Radio Corp.
**Je3**—Radio Receiver Catalog. Modell's*
**Je4**—Catalog on P. A. equipment. United Sound Engineering Co.*
**Je5**—Tube Chart Arcturus Radio Tube Co.*
**Jy1**—Instrument Topics. A new folder published periodically by Clough-Brengle Co.*
**Jy2**—Instrument Catalog. Triplett Electrical Instrument Co.
**Jy3**—Catalog on industrial capacitor replacements for refrigerators, etc. Aerovox Corp.*
**Jy4**—Sound Equipment Guide. Wholesale Radio Service Co.
**Jy5**—Parts Catalog. Radolek Co.*
**Jy6**—Latest Catalog on accessories. Radio Corp. of America.*
**At1**—Broadside on Super-Pro. Hammarlund Mfg. Co.
**At2**—Catalog on Transmitting Equipment. Wholesale Radio Service Co. Inc.*
**At3**—Folder on Western Electric 633, a dynamic microphone.
**At4**—Tube Folder. Weston Electrical Instrument Corp.*
**At5**—P. A. Catalog. Webster Co.
**At6**—Catalog on Electrical Wiring Accessories. Harvey Hubbell Co.*

## Big-Screen Television

(*Continued from page* 143)

and usually in fair weather. Such events as parades and races also offer no great difficulty with illumination, they said. Pick-ups of football games showed less likelihood of satisfaction—particularly those extending into late afternoon hours of the sport's later season. But the engineers pointed out that the television equipment cannot be blamed for any shortcomings because even the persons in the stadiums must strain their eyes to follow plays under such conditions.

But in a later paper by Dr. V. K. Zworykin, G. A. Morton and L. E. Flory, it was revealed that new Iconoscopes, now in their later experimental stages of development, bring within possibility sensitivity many times that of present pick-up equipment. They claimed that such advances will improve the television camera's ability to pick up scenes in bad weather or at other times when illumination is low.

The theory and performance of the Iconoscope was also discussed. Because the broad theory of Iconoscope operation had been known to the I. R. E. members for some time, the new paper dealt with a detailed mathematical exposition of the principal factors involved.

Albert Rose and Harley Iams spoke on the general technical considerations of pick-up tubes utilizing cathode-ray scanning, pointing out that the one favored by RCA was to allow a constant number of electrons strike the surface while controlling the secondary emission by electric or magnetic fields.

### There are Two Howards

Chicago, Ill.—Howard Radio Company of Chicago, a manufacturing concern, has no connection with Howard Radio Company, Inc., of New York City, a chain of radio retail stores. The New York Howard has been reported in bankruptcy; while the Chicago manufacturer is doing business as usual.

# The DX Corner

## (Short Waves)

(*Continued from page* 164)

**HBL,** Geneva, Switzerland, 9345 kc., Saturday 5:30-6 p.m., 6:45-8 p.m., (from veri.), (Waser), 9595 kc., (from veri.), (Fallon, Magnuson, Hartzell), Address: 12 Quai de la Poste, Geneva.

**HBJ, HBF,** Geneva, Switzerland, 14,530 kc., (White), 8:30 p.m., (Eder), Saturday 6:45-8 p.m., 11,402 kc., (Fallon, Hendry, Gresham, Kernan), 6:45-11 p.m., (Sakely, Dressler, Hartzell, Magnuson, Hartman, Shamleffer), Address: same as HBL.

**HBO,** Geneva, Switzerland, 11,402 kc., (Williams), Saturday 6:45 p.m., (Hendry, Gresham, Jaime), Saturday 8:10 p.m., (Lara), 6:45-11 p.m., (Sakely, Dressler, Hartzel, Unger, Shamleffer, Magnuson, Dressler, Hartman), Address: same as HBL.

**EAQ1,** Madrid, Spain, 9500 kc., 3-6 a.m., (Ruiz), 9860 kc., daily 6:30-9:30 p.m., Saturday only 1-9:30 p.m., (from veri.), (Williams, Alfred, Gallagher, Eder), 12-2 p.m., (Doyle, Law, Hedgeland, Kemp, Dressler, McGowan).

**EAQ2,** now EAR, Madrid, Spain, 9800 kc., 6:15-8 a.m., (Ruiz), 9490 kc., 9 p.m., (Eder), 9584 kc., (Diez, Lara, Hedgeland, Kemp, Chagaris, Alfred, Jaime) 5-9 p.m., (Davis, Dressler, Coover, Hartzell, Birnie, Hartman).

**"Radio Journal,"** San Sebastian, Spain, 7203 kc., insurgent station, news at 1:30 p.m. daily, (Westman).

**ECN1,** Barcelona, Spain, 6995 kc., 5:30 p.m., (Smith), 7350 kc., Friday 8:05-9:05 a.m., (Gallagher).

**TPA4,** Pontoise, France, 11,720 kc., 11-12 p.m., (Prosser, Diez, Eder), 5:15-12 p.m. (Hedgeland, Hendry, Randle, McGowan), Slogan: "Radio Coloniale," Address: same as TPA2.

**Radio Liberty,** Paris, France, 7380 kc., signs at 8 p.m., (Robinson, Hendry).

**TPA2,** Pontoise, France, 15,240 kc., (Gallagher), daily 12:30-2:30 p.m., (Westman), 5-10 a.m., (Ruppert, Hedgeland, Westman, Randle, Yoshimura), Slogan: "Radio Colonial," Address: 98 Bis, Boulevard, Haussman, Paris.

**TPA3,** Pontoise, France, 11,880 kc., (Eder), 11:15 a.m.-5 p.m., (Hedgeland), daily 1-4 a.m., (Randle), Address: same as TPA2.

### DULUTH ON THE MAP

*Meet Ed Peterson, a Minnesota short-wave fan who uses an SW3 and is especially interested in 10-meter reception.*

### North America

**XEWW,** Mexico D. F., Mexico, 9500 kc., heard 11 a.m., (Umstead) Monday, Tuesday, Wednesday, 10 p.m.-1 a.m. (Tarr, Beck, Fallon) daily 6-12 p.m., (Davis) daily 8 a.m.-12:30 a.m. (Geneve, Markuson), relays XEAW; desires reports, (Novas, Kemp, Partner, Gallagher). Slogan: "The Voice of Latin America." Address: P. O. Box 2516.

**XEW, XECW,** Mexico D.F., Mexico, 9495 kc., heard 9:03 p.m.-12:52 a.m., (Eder) 11,990 kc., (Alfred) 6080 kc., (Lopez, Beck) 10,578 kc., (Diez) 15,180 kc., (Markuson). Slogan: "La Voz de las Americas," "La Voz Del Continente."

**XEWI,** Mexico D. F., Mexico, 11,900 kc., heard 10:35 p.m. (Eder, Alfred), two gongs before announcement, (Unger, Fallon) 10-12 p.m. (Kernan, Diez), Monday, 3-4 p.m., 9-12 p.m., Tuesday, 7:30-12 p.m., Wednesday and Friday 3-4 p.m., 9-12 p.m., Thursday, 7:30-12 p.m., Saturday, 9-12 p.m., and Sunday, 12:30-2 p.m. (Shamleffer). Slogan: "My Voice to the World from Mexico." Address: P.O. Box 2874.

**XEWU,** Mexico D. F., Mexico, 9500 kc.; 4 note chime used; signed at 12:25 a.m., (Williams) heard 8:30 p.m., (Nigh) 5163 kc., (Hartzell). Slogan: "The Voice of Latin America for Mexico City.

**XEBT,** Mexico D. F., Mexico, 6000 kc.; signed at 12:23 a.m. (Williams), heard 7-8 p.m. (McGowan) uses siren, (Hendry). Slogan: "El Buen Tono."

**XEYU,** Mexico D. F., Mexico, 9600 kc.; heard 11:30-12 p.m., with chimes, (Williams), requests reports, (Alfred). Address: Napopi 60.

**Vera Cruz,** Mexico, 15,265 kc.; heard Saturday, 3-4:45 p.m. and 12-12:52 a.m.; used cat "howling" and 4 chime notes; (Welper). Slogan: "World Broadcasting Station."

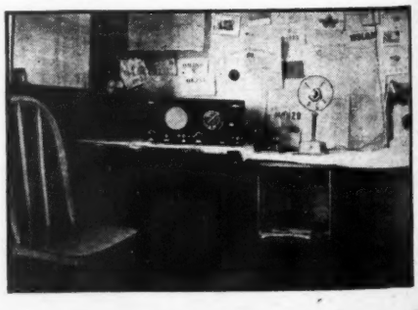
**XEME,** Merida, Yucatan, Mexico, 9520 kc.; used three note chime, (Williams) heard 11-12 p.m. (Prosser) 8190 kc., 5:30-10 p.m., (Doyle).

**XEFT,** Veracruz, Mexico, 9510 and 6120 kcs., 10:30 a.m.-4:30 p.m., and 7:30 p.m.-12:30 a.m. (from veri), (Williams) 9460 kc., (Alfred, Wilson, Wacker) 9580 kc., (Diez, Doyle). Slogan: "La Voz de Vercruz." Address: Ave., Independencia 28.

**XEPW,** Mexico D. F., Mexico, 6110 kc., (from veri.), (Williams) 8:30-1:30 a.m., (Doyle). Slogan: "La Voz del Aquila Oztica

### HE PULLS IN EVERYTHING!

*Observer Doyle of Florence, Colorado, sends in this photo of his DX Corner featuring a Sky-Buddy receiver.*




TELEVISION STATION W9XG
PURDUE UNIVERSITY
WEST LAFAYETTE, INDIANA
Date 5-15 1937
Dear Mr.
We thank you for your report on W9XG signals and pictures.
Remarks:
W9XG
Program: Standard motion picture film; newsreels, etc.
Transmission at 60 lines per picture and 20 pictures per second. Single spiral disc. No sound accompaniment; voice announcements only.
Frequency: ~~2,800~~ Kc. 2050
Power output: Varies from time to time; maximum of 1,500 watts.
Time of Operation:
Days: Hours: (C.S.T.)
Tuesday 7:30
Thursday 8:00 PM

A TELEVISION VERIFICATION

*Mr. Zane Sprague of Covington, Ind., sends us the first television station verification that we have seen.*

des de Mexico." Address: Jose G. Garza Fox y Hijo, P.O. Box 8403.

**XEUZ**, Mexico D.F., Mexico, 6120 kc., (Williams, Hendry, Birnie).

**XETW**, Tampico, Mexico, 6045 kc., heard 7 p.m., (Robinson).

**XEDQ**, Guadalajara, Mexico, 9480 kc., (from veri.), (Williams) heard 10:00-10:30 p.m., (Alfred). Address: P.O. Box 197; P.O. Box 137.

**XEXA**, Mexico D. F., Mexico, 6132 kc., (Williams, Sargent) 6 p.m.-12:15 a.m. (Doyle) 6175 kc., heard Monday 11:30 p.m., (Chagaris).

**XEUW**, Vera Cruz, Mexico, 6020 kc., heard 12:30 a.m. (Hendry) heard 8:15 a.m., (Diez).

**XEXS**, Mexico D. F., Mexico, 6200 kc., signed at 12:15 a.m.," (Hendry).

**XEBO**, Mazatlan, Mexico, 6030 kc., (Harris).

**XETM**, Villa-Hermosa, Mexico, 11525 kc., heard 6:30-10 p.m., (Harris), 11,750 kc., (Diez) 11,730 kc., (Robinson).

**XEBR**, Hermosillo, Sonora, Mexico, 11,820 kc., heard 1-4 p.m., 9-12 p.m., (Alfred, Betances, Wilson), 11,730 kc., (Diez, Doyle). Slogan: "Radio Difusora de Sonora." Address: P. O. Box 68.

**XEIX**? Mexico D. F., Mexico, 11,950 kc., heard Friday at 6 p.m., (Hartzell).

**XECU**, Mexico, D.F., 6120 kc., heard Monday, 9-11:10 p.m., (Sporn).

**XEBM**, Mazatlan, Mexico, 1,5365 kc., Monday, 8:30 p.m., (Sporn, Doyle).

**W1XAL**, Boston, Mass., 15,250 kc., heard 6 p.m., (McGowan) 11,790 kc., (Jensen, Randle, Gallagher). Address: University Club, Boston.

**W4XBW**, Chattanooga, Tenn., 31600 kc., will resume transmissions around July 1, (Alexander).

**W2XAF**, Schenectady, N. Y., 9530 kc., heard 7:30-8 p.m., (Prosser) daily 5 p.m.-1 a.m., (Duncan, Hartzell, Wacker, McGowan, Davies).

**W8XK**, Pittsburgh, Pa., 11,870 kc., heard 7:30-8 p.m., (Prosser) 6140 kc., (Duncan, Hendry) 10-10:30 p.m., (Wacker, Chagaris, Davies).

**W9XF**, Chicago, Illinois, 6100 kc., schedule: Sunday through Friday, 10:05 p.m.-1 a.m., Saturday, 12:05-1 a.m., (from veri.) (Gallagher) 6097 kc., (Diez, Lindner).

**KWO**, Dixon, Calif., 15415 kc., (Alfred).

**KKQ**, Bolinas, Calif., 11,950 kc., heard 11:45 p.m., (Alfred, Nigh).

**KKL**, Bolinas, Calif., 15,475 kc., heard 11:30 p.m.- 12:30 a.m., (Nowak).

**KKZ**, Bolinas, Calif., 13,690 kc., heard 10-11 p.m., (Alfred).

**W1XK**, Springfield, Mass., 9570 kc., (Oglesby).

**W2XE**, New York, N. Y., 11,830 kc.; 11,900 kc., (Wittig) 6120 kc.; 15,270 kc., 17,760 kc., and 21,520 kc., (Blanchard) heard 8 p.m., (Chagaris, Diez, Jensen).

**KEJ**, Bolinas, Calif. 9010 kc., Saturday 11-11:45 p.m., (Sporn).

**W2XDV**, New York, N. Y., 31,600 kc.; 35,600 kc., 38,600 kc., and 41,000 kc., (Blanchard) relays WABC.

**W3XAU**, Philadelphia, Pa., 9590 kc., heard 6:21 p.m., (Jaime).

**W6XKG**, Los Angeles, Calif., 25,950 kc., send reports c/o KGFJ, (Mechling).

**W2XAD**, Schenectady, N. Y., 15,330 kc., daily 10 a.m.-8 p.m., (Duncan. Unger, Chagaris, Diez, Jensen, Kentzel).

**W3XAL**, New York, N. Y., 6100 kc., heard 10 p.m., (Duncan), 17,780 kc., (Wittig, Wacker, Chagaris).

**W9XAZ**, Milwaukee, Wisconsin, 26,400 kc., daily 1-12 p.m., (from veri.) (Lopez, Randle, Wacker, Nowak).

**W8XWJ**, Detroit, Michigan, 31,600 kc., (Randle).

**W3XES**, Baltimore, Md., 35,600 kc., daily 5-12 p.m., requests reports, (from veri.), (Randle).

**W9XPD**, St. Louis, Mo., 31,600 kc., requests reports, (Randle).

**W8XAL**, Cincinnati, Ohio, 6060 kc., (Randle) daily at 12:55 p.m. (Diez).

**W4XB**, Miami, Florida, 6040 kc., heard 11 a.m.-1 p.m. (Ruppert).

**WWV**, Beltsville, Md., 5000 kc., 10-11:30 a.m.; 10,000 kc., 12-2:30 p.m.; 20,000 kc., 2-3:30 p.m., on Tuesdays; freq. checks, (Hartzell).

**W1XK**, Millis, Mass., 9570 kc., heard 5 a.m., (Hendry).

**CIRO**, Winnipeg, Canada, 6150 kc., (Hendry), signed at midnight, (Hendry, Duncan).

**CJRX**, Winnipeg, Canada, 11,628 kc., daily at 8:15 p.m., (Wollen, Schlager), 10:45-11 p.m., (Wacker, Diez, Doyle, Duncan, Coover).

**CFCX**, Montreal, Canada, 6005 kc., 8 a.m.-11:15 p.m., Sunday, 9 a.m.-1:15 pm., (from veri.), (Magnusen).

**VOWM**, North West River, Labrador, Canada, 8650 kc., heard 8:30 p.m., (Kentzel).

**VE9HX**, Halifax, Nova Scotia, Canada, 6110 kc., heard 7-8 p.m. (McGowan); CHNX, heard 5-12 p.m., (Doyle).

**CFRX**, Toronto, Canada, 6070 kc., heard 5-6 p.m., (McGowan, Unger), relays CFRB; heard 7-1 a.m. (Nigh, Ruppert, Hartman).

**CRCX**, Bowmanville, Ontario, Canada, 6090 kc., heard 3-4 p.m., (McGowan) Sunday, 5:30-11:30 p.m., (Doyle).

### Central America

**TIEP**, San Jose, Costa Rica, 6710 kc., heard 11:45 p.m., (Rabat, Williams), clock chimes used, (Smith, McGowan, Coover). Slogan: "La Voz del Tropico." "The Voice of the Isthmus." Address: P. O. Box 57.

**TILS**, San Jose, Costa Rica, 5900 kc., heard 9:55 p.m., (Eder), signed in English at 11:25 p.m., (Williams), 5800 kc., (Jaime) daily 1-3:30 p.m., 7-12 p.m., (from veri.), (Betances). Slogan: "Parati." Address: P. O. Box 3.

**TIPGH**, San Jose, Costa Rica, 5830 kc., call preceded by 4 note gong; signed at 11:30 p.m., (Williams), 5820 kc., heard 6-10 p.m., (McCartin. Hartzell, Diez, Hendry).

**TIPG**, San Jose, Costa Rica, 6410 kc., Wednesday and Saturday, 9-10 p.m., (Smith) daily 6-11:30 p.m., (from veri.), (Hendry, Eder), 9410 kc., (Doyle, Sargent, Diez). Slogan: "La Voz de Victor."

**TIOW**, Puerto Limon, Costa Rica, 6896 kc., heard 10:52 p.m., (Diez).

**TI2X**, San Jose, Costa Rica, 5825 kc., heard daily 11:15 p.m., (Diez).

**TI4NRH**, Heredia, Costa Rica, 9670, kc. heard 8:30-10 p.m., (Nigh, Robinson).

**TIVL**, San Jose, Costa Rica, 6635 kc., (Betances). Slogan: "Voice of Morazan."

**YNIPR**, YNPR, Managua, Nicaragua, 8580 kc., Friday with German hour, 10-11 p.m., (Hendry) 8600 kc., 8-10:30 p.m., (Fallon, Gallagher). Slogan: "Radio Pidot."

**YNPR**, Managua, Nicaragua, 8600 kc., heard irreg., (Diez).

**YNOP**, Managua, Nicaragua, 5758 kc., heard 10:18 p.m., (Diez).

**YNLG**, Managua, Nicaragua, 6315 kc., heard 11:11 p.m., (Diez) 8580 kc., daily 7:30-10 p.m., (Hartzell, Hendry).

**TGWA**, Guatemala, Guatemala, 9450 kc., daily 12-3 p.m., and 8-12 p.m., Sunday, 12-6 a.m., (from veri.), (Williams, Smith, Doyle, Dressler, McGowan).

**TG2X**, Guatemala, Guatemala, 5940 kc., (from veri.). (Williams).

**TG2**, Guatemala, Guatemala, 6310 kc., (Umstead) heard 12:32 a.m., (Jaime, Birnie). Address: Director-General of Electrical Communications.

**HRD**, La Ceiba, Honduras, 6235 kc., signed at 10:05 p.m., and at 11:05 p.m., (Williams, Doyle) daily 8-11 p.m., (Hartzell) Sunday 4-6 p.m., (from veri.) (Fallon).

**HRN**, Tegucigalpa, Honduras, 5875 kc., daily at 9 p.m., (Diez).

**HP5K**, Colon, Panama, 6000 kc., N.B.C. chimes and short bugle call, (Sargent, Fallon). Slogan: "La Voz de la Victor." Address: P. O. Box 33.

**HP5L**, David, Panama, 11,740 kc., requests reports, (Randle) 1-2:30 a.m., (Doyle). Address: P. O. Box 129.

**HP5H**, Panama City, Panama, 6130 kc., heard Thursday, 12:30-2:15 a.m., (Hartzell).

**HP5J**, Panama, 9590 kc., heard Tuesday 9-9:30 p.m., (McGowan).

**HP5K**, Colon, Panama, 6000 kc., relays HP50, (Beck), short bugle call, (Sargent) 9590 kc., (Diez). Slogan: "La Voz de la Victor." Address: P.O. Box 33.

**HP5I**, Aguadulce, Panama, 11,895 kc., heard 7:30-9:30 p.m., (Ralat). Slogan: "Lo Voz del Interior."

**HP5B**, Panama City, Panama, 6030 kc., heard 8:20 p.m., (Sporn, Jaime).

### Asia

**PLE**, Bandoeng, Java, 18830 kc., heard irreg. near 7 p.m., (Alfred).

**PMC**, Bandoeng, Java, 18135 kc., heard Sunday, 10:10 a.m., (Alfred).

**PLP**, Bandoeng, Java, 11,00 kc., heard 6-7:30 a.m., (Alfred, Welper, Partner, Gallagher, Shamleffer).

**YDB**, Soerabaja, Java, 9550 kc., 5:30-11 a,m., (Partner, Davis, Gallagher).

**PMY**, Bandoeng, Java, 5150 kc., daily 5:30-11 a.m., (White, Sporn).

**PMH**, Bandoeng, Java, 6720 kc., (Gallagher).

**YDA**, Tandjongpriok, Java, 6030 kc., Monday 1:15-1:25 a.m., (Sporn).

**PMN**, Bandoeng, Java, 10,260 kc., 5:30-11 a.m., (Partner, Gallagher).

**YDC**, Bandoeng, Java, 15,150 kc. 5:30-10 a.m., except Sunday; Saturday, 5:30-11 a.m., (Partner).

**ZBW3**, Hong Kong, China, 9530 kc., (Stevens, Doyle, Yoshimura).

**CQN**, Macao, China, 10,135 kc., Monday and Friday, 7-8:30 a.m., (from veri.). (Wilson). Address: Chief of Radio Station, P.O. Building, Macao, South China.

**ZHJ**, Penang, S.S., 6080 kc., daily 7:30-9 a.m., (Stevens)

**ZBW4**, Hong Kong, China, 15,140 kc, heard 6:55 a.m., (Diez) 15,190 kc., (Millen) heard 7:30 a.m., (Shamleffer).

**XTV**, Canton, China, 9490 kc., heard 7-10 a,m., (Millen) 9470 kc., (Gallagher).

**FZR**, Saigon, Indo-China, 16,233 kc., heard 7:15 p.m., (Alfred) 11,730 kc., 4:30-9 a.m., (Partner).

**XGOX**, Nanking, China, 6820 kc., weekdays 5:30-8:30 a.m., Sunday 7-9 a,m., (from veri.), (Wilson).

**XOJ**, Shanghai, China, 15,800 kc., heard 11:43 p.m., (Alfred, Gross, Gallagher).

**ZBW**, Hong Kong, China, 9525 kc., heard 7-7:30 a.m., (Alfred, Eder, Skinner, Tate, Hendry). Address: P. O. Box 200.

**JZI**, Nazaki, Japan, 9535 kc., daily 9-10 a.m., (from veri.), (Alfred, Doyle, Hare, Westman, Jensen).

**JVH**, Nazaki, Japan, 14,600 kc., (Ohi, Eder).

**JZK**, Nazaki, Japan, 15,160 kc., 12-1 a.m., daily, (Umstead, Ohi, Eder), desires reports, (Cox, Markuson) daily 9-10 a.m., 2:30-3:30 p.m., 4-5 p.m., (Partner, Hartzell, Sakely, Stiles, Westman, Coover, Jensen), replacing JZI, (Robinson, Gross).

**JYM**, Nazaki, Japan, 10,740 kc., daily 2:30-3:30 p.m., (from veri), (Alfred, Stevens, Diez, Doyle, Hare, Sakely, Westman).

**JVN**, Nazaki, Japan, 10,660 kc., daily 4-5 p.m., (from veri.), (Alfred) daily 5:30-7 p.m., (Stabler, Westman, Doyle, Diez, Lara, Kemp, Hare, Markuson, Gallagher).

**JZJ**, Nazaki, Japan, 11,800 kc., daily 2:30-3:30 p.m., 4-5 p.m., and 12-1 a.m., and 9-10 a.m., (from veri.), (Alfred, Hartzell, Stevens, Westman, Eder, Ohi, Diez, Doyle, Lara, Poll, Unger, Hare, Markuson, Partner, Lorvig, Pylate, Yoshimura, Gallagher, Jensen).

**JVT**, Nazaki, Japan, 6800 kc., daily 6:22 a.m., (Diez) irreg. and daily 7-8 a.m., (Westman).

**JYT**, Kemikawa-Cho, Japan, 15,760 kc., heard irreg., 6-9 a.m., (Westman).

**JVF**, Nazaki, Japan, 15,620 kc., (Doyle).

**JVE**, Nazaki, Japan, 15,660 kc., (Doyle, Chambers), heard 1:25 a.m., (Gallagher).

**JVI**, Nazaki, Japan, 9525 kc., (Doyle).

**VUB**, Bombay, India, 9565 kc., schedule: Sunday and Tuesday, 11:30 p.m.-12:30 a.m., (Smith) Sunday, Monday, Thursday, Friday, and Saturdays, 10:30 a.m.-12:30 p.m., (Westman, Doyle, Hedgeland).

**RV15**, Khabarovsk, Siberia, U.S.S.R., 4273, 7690, and 8550 kcs., daily 11 p.m.- 10:30 a.m., (Tarr), 2-9 a.m., (Randle).

**ZHJ**, Penang, S. S., 6055 kc., heard 7-9 a.m., (Gallagher) daily except Sunday, 7:45-9:45 a.m,. (Randle).

**HS8PJ**, Bangkok, Siam, 9360 kc., only; (Stevens), Thursday, 8-10 a.m., (Hedgeland), Monday, 8-10 a.m., (Randle).

**BURMA**, India, 6007 kc., daily at 9:30 a.m.; no call, signed with "God Save the King", (Gertenback).

**VPB**, Colombo, Ceylon, 6150 kc., daily 6-10 a.m., except Sunday; Sunday, 9-11 a.m., (Westman, Doyle), 6135 kc., daily except Sunday, 7-8:45 a.m., (Partner), 6120 kc., (Gallagher).

**VWY2**, Poona, India, 17,480 kc., and 17,540 kc., (Doyle).

**ZGE**, Kuala Lumpur, Federated Malay States, 6230 kc., Sunday, Tuesday, and Thursday, 6:45-8:45 a.m., and irreg., (Partner), 6250 kc., (Gallagher).

**Y15KG**, Bagdad, Iraq, 40 meters, amateur broadcasting, Tuesday, Wednesday, Friday, and Sunday, 11 a.m.-3 p.m., (Kouyoundjian).

### Africa

**CR7BH**, Lourenco Marques, Portuguese East Africa, 11,718 kc daily 9:30-11 a.m. Sunday, 10 a.m.-12:30 p.m. (Tarr, Gross). Daily except Sundays 4:30-6:30 a.m.; 12:30-5 p.m. Sun. 6-8 a.m.; 10 a.m.-12:45 p.m. and 1:30-3:30 p.m. Address: P.O. Box No. 594 (Burt, Westman, Gallagher, Skinner)

**VQ7LO**, Nairobi, Kenya, 6083 kc., heard 1:30-2:30 p.m. on Wednesday and Saturday (Smith). Monday through Friday 5:30-6 a.m. and 11:45 a.m.-2:45 p.m. Tuesday and Thursday, 8:45-9:45 a.m. Also, Sunday 11:45 a.m.-12:15 p.m. Saturday 6-6:45 a.m., 11:15 a.m.,-2:15 p.m. (from veri) (Smith, Hedgeland, McCartin).

**EAJ43**, Tenerife, Canary Islands, 10,360 kc. Daily 8-10 p.m., (Alfred). Daily around 4 p.m. (from veri.) (Smith, Hartzell, Gross, Diez, Doyle, Lara). Slogan: "Radio Tenerife." Address: P. O. Box No. 225.

**CR7AA**, Lourenço Marques, Mozambique, 6137 kc. Same at CR7BH. (Burt, Doyle). Address: P. O. Box No. 594.

**FIU**, Tananarive, Madagascar, 9,450 kc., 9:45-11 a.m. on alternate frequencies. (Westman), Daily 11-12 a.m. except Sunday. 9530 kc., 11-12 daily except Sunday, 11,850 kc., irregular, 11,800 kc., 11-12 a.m. irr., 6,005 kc. irr. (Burt).

**EA9AH**, Tetuan, Spanish Morocco, 6,000 kc. Heard 3-5:30 a.m. Ruiz, 6,500 kc. 5-6 p.m. and 8-9 p.m. (Betances), 14,030 kc. (Jordan, Skinner), Daily except Sunday 7-9 p.m. (Nigh, Millen, Kentzel). Slogan: "Voice of the Trenches". (Robinson, Nowak).

**ZEA**, Salisbury, Rhodesia, South Africa, 6,143 kc. Heard Monday 1:25 a.m. and 11 a.m. (Sporn).

**ZNB**, Mafeking, Bechuanaland Protectorate, 5,900 kc. Daily 1-2:30 p.m. except Saturday and Sunday. Sunday 1:30-2:30 p.m. Address P. O. Box No. 106 (Burt).

**ZTJ**, Johannesburg, Union of South Africa, 6,098 kc. Daily 11:45 p.m.-12:30 a.m., 3:15-7 a.m., 9 a.m.-4 p.m. except Sunday. Saturday 9 a.m.-4:45 p.m. Sunday, 3:30-4:45 a.m. and 8 a.m.-3:20 p.m. Address P.O. Box No. 4559 (Burt, Ruppert).

**ZEB**, Bulawayo, Southern Rhodesia, 6147 kc., Thursday, Sunday and Friday, 11 a.m.-12 p.m., Thursday and Tuesday, 1:15-3:15 p.m. Friday 10-10:45 a.m. Sunday, 3-4:30 a.m. (Burt) Address: P. O. Box No. 792.

**ZEA**, Salisbury, Southern Rhodesia, 5800 kc. Same address and schedule as ZEB (Burt) Djibouti, French, Somaliland, 17,280 kc. (Doyle).

**ZUD**, Pretoria, Union of South Africa, 8,730 kc. Heard irregularly (Robinson).

**Klipheuvel**, Union of South Africa, 8,900 kc. Heard 7 a.m.-2:30 p.m. (Gertenbach) Address: P. O. Box, No. 962 Capetown.

### Oceania

**VK2MW**, Sydney, Australia, 9,585 kc. Heard 6-6:30 a.m. (Alfred) 10,526 kc. Heard Sunday 12:30 a.m. (Davis), 9,680 kc. (Diez, Eder, Lindner, Doyle, Hedgeland, Unger), Saturday 12-2 a.m., Sunday 5-9 a.m. and 11:30 a.m.-1:30 p.m. (Skinner).

**VK6ME**, Perth, Australia, 9,590 kc. Daily 6-8 a.m. (Smith, Eder, Partner, Doyle, Unger).

**FO8AA**, Papeete, Tahiti, 7,100 kc. Heard Tuesday and Friday 11-12 p.m. (Umstead, Hartzell).

**KIO**, Kahuku, Hawaii, 11,680 kc. Heard irregularly (Markuson, Beck ,Gallagher).

**ZLT**, Wellington, New Zealand, 11,050 kc. Heard Sunday 1:10-1:25 a.m. (Sporn).

**VK3LR**, Lyndhurst, Australia, 9,850 kc. Heard 2 a.m. (Smith), Sunday through Friday, 6-11:30 p.m., Saturday 1-11:30 p.m. (Alfred) 6-8 a.m. (Myers, Eder). Daily 3:30-8:30 a.m. (Markuson, Kemp, Hedgeland, Gallagher, Jensen, Unger).

**KAY**, Manila, Philippine Islands, 14,980 kc. Heard 4:13 p.m. (Alfred).

**VK3ME**, Melbourne, Australia, 9,500 kc. Signed at 7 a.m. with clock striking (Alfred, Eder). Daily 4-8 a.m. (Markuson, Oglesby), irregularly, (Hartzel, Kemp, Westman, Doyle, McGowan, Unger), daily except Sunday 4-7 a.m. Saturday 12-2 a.m., Sunday 4-9 a.m. and 11:30 a.m.-1:30 p.m. (Skinner, Hendry).

**VPD2**, Suva, Fiji Islands, 9,530 kc. heard 7 a.m. (Eder), 9,540 kc. (Foshay, Birnie, Hendry).

**VPD**, Suva, Fiji Islands, 9540 kc., heard 6 a.m. (Westman).

**KKH**, Kahuku, Hawaii, 7,620 kc. (Hartzell) 1:15-1:30 a.m. (Gallagher).

**KKP**, Kahuku, Hawaii, 1,040 kc Heard 7:45 p.m. (Chambers), Heard 2:10-2:30 a.m. (Beck, Gallagher, Jensen).

**KQH**, Kahuku, Hawaii, 14,900 kc. Heard 1 a.m. (Gallagher).

**ZMBI**, S. S. Awatea, 8,840 kc. Is now closed to broadcasting (from report), (Sakely, Kemp.)

**WMEF**, S. S. Avocet, 17,310 kc. Anchored off Canton Island. Heard 9-10:05 a.m. (Kentzel, Jensen) First call was W3X2 (Gallagher).

**KZRM**, Manila, Philippine Islands—11,890 kc. Heard 5-8 a.m. irregularly (Markuson, Gallagher). Slogan: "Radio Manila".

### South America

**VP3MR**, Georgetown, British Guiana, 6,010 kc. Monday through Saturday, 6:45-10:45 p.m. Sunday 10:15-1:15 p.m. from veri, (Smith, Alfred), 6,070 kc., (Rupert, McCartin, Randle). Slogan: "The Voice of Guiana".

**VP3BG**, Georgetown, British Guiana, 6,131 kc. Heard 4:30-6 p.m. (Millen). Theme is "God Save the King".

**CP1**, Sucre, Bolivia, 9,895 ks. Heard 8 p.m. (Skinner, Gallagher).

**LRU**, Buenos Aires, Argentina, 15,280 kc., daily 6 a.m.-10 p.m. (Smith, Williams, Henry). 15,250 kc. Heard 7 a.m. (Diez, Eder, Lara), Daily 7 p.m. (Randle).

**LRX**, Buenos Aires, Argentina, 9,600 kc., daily 6 a.m.-10 p.m. (Smith), Heard 6-7 a.m. (Ruiz), 9,660 kc. (Eder, Williams, Alfred), daily 5-11:30 p.m. Chimes before announcements. (Hartzel) 9,708 kc. (Diez, Lara). Slogan "Radio El Mundo".

**LSX**, Buenos Aires, Argentina, 10,350 kc. 5-6 p.m. (Doyle) Monday and Friday, 5-11 p.m. (Nigh).

**YV2RA**, San Cristobal, Venezuela, 5,720 kc. Heard irregularly, (White). Slogan: "La Voz Del Tachisa" 5,755 kc. (Foshay).

**YV5RC**, Caracas, 5,800 kc. Heard 9:30 p.m. (Eder) (from veri.), (Williams,). Heard daily 10-10:30 p.m. (Alfred), daily, 4-9:30 p.m. (Hartzell, Diez, Coover). Slogan: "La Habla a la Nacion" (Radio Caracas).

**YV3RA**, Barquisimeto, 5,880 kc. 11 a.m.-1 p.m. and 5-10 p.m. Chimas (from veri.) (Williams). Slogan: "La Voz de Lara."

**YV5RP**, Caracas, Venezuela, 6,270 kc. heard 7-10:30 p.m. (Alfred, Jaime, Hendry, Eder, Fallon, Hartzel). Slogan: "La Voz de Philco".

**YVQ**, Maracay, 13,337 kc., heard 10:30 a.m. (Alfred, Patrick).

**YV4RB**, Valencia, Venezuela, 6,520 kc., heard 6-10 p.m. (Alfred). Slogan: "La Voz de Carabobo."

**YV1RL**, Maracaibo, Venezuela, 5,430 kc., heard 8:30 p.m. (Ralat), from veri. (Randle). Slogan: "Radio Popular". Address: P. O. Box No. 247.

**YV1RH**, Maracaibo, Venezuela, 6,300 kc., heard 6-11 p.m. (Hendry, McGowan, Hartzell, Diez), 6,390 kc. (Lara, Coover). Slogan: "Ondas del Lago."

**YV5RJ**, Caracas, Venezuela, 6,250 kc., daily 5:30-10:30 p.m. (Hartzell, Hendry). Slogan: "La Voz de Laferia."

**YV4RB**, Valencia, Venezuela, 6,520 kc., heard 7:21 p.m. (Jaime).

**YV5RB**, Caracas, Venezuela, 6,158 kc., daily 9:03 p.m. (Forshay, Diez).

**YV1RI**, Coro, 6,210 kc. (Forshay). Slogan: "Radio Coro."

**YV1RO**, Maracaibo, Venezuela, 6,070 kc., (Forshay). Address: P. O. Box No. 100.

**YV6RC**, Bolivar, Venezuela, 6,420 kc., daily until 9:15 p.m. (Forshay). Slogan: "Radio Bolivar."

**YV1RB**, Maracaibo, Venezuela, 5,917 kc., heard 8:47 p.m. (Diez) 5,850 kc., heard 6-10 p.m. (McCartin).

**YV4RA**, Valencia, Venezuela, 6,507 kc., heard daily at 7:12 p.m. (Diez).

**YV5RF**, Caracas, Venezuela, 6,380 kc., daily 3:30-9:30 p.m. (Hartzell).

**YV1RG**, Valera, Venezuela, 6,230 kc., heard 5:30-9:30 p.m. (Robinson).

**HC2ET**, Guayaquil, Ecuador, 4,600 kc., Wednesday and Sunday, 9-11 p.m. (White).

**HC2ODA**, Guayaquil, Ecuador. 9,440 kc., (Diez, 9,280 kc. and 9,370 kc., (Gallagher).

**HC2RL**, Guayaquil, Ecuador, 6,600 kc. Sunday 5:45-7:45 p.m. and Tuesday 9:15-11:15 p.m. (from veri) (Williams), 6,635 kc. (Alfred, Hartzell, Nowak), 6,668 kc., (Birnie, Coover). Slogan: "Quinta Piedad". Address P. O. Box No. 759.

**HC2CT**, Ecuador, 7,975 kc., heard Wednesday 6:10-7:30 a.m. (Sporn).

**HC2JSB**, Guayaquil, Ecuador, 7,854 kc., daily 9 a.m.-2 p.m., 4-11 p.m., (from veri). (Alfred, Wilson), 6,073 kc. (Diez). Slogan: "Ecuador Radio".

**PRADO**, Riobamba, Ecuador, 6,620 kc. heard Thursday 9:30-11:30 p.m. (Alfred, Diez, Hartzell, Coover). Slogan, "Estacion El Prado." Address: P. O. Box, No. 98.

**HCJB**, Quito, Ecuador, daily except Monday, 12:30-1:30 p.m. (Westman).

**HJ1ABP**, Cartagena, Colombia, 9,600 kc. (from veri.) (Van Meter), 9,610 kc., (Eder, Williams). Daily 10-10:30 p.m. (Alfred, Stabler, Magansen, Diez, Lara). 7-9 a.m. (Hendry, McGowan, Nigh, Coover). Slogan: "Radio Cartagena". Address: P. O. Box No. 7.

**HJ1ABG**, Barranquilla, Colombia, 6,042,5 kc., daily 10 a.m.-11 p.m., Sunday 11 a.m.—8 p.m. Signs with chimes (from veri). (Williams, Wittig, McCartin). Slogan: "Emisora Atlantico".

**HJ1ABJ**, Santa Marta, Colombia, 6,025 kc., heard 7:02 p.m. (Jaime) heard 11:25 p.m. (Diez), signed at 11 p.m. (Williams, Tate).

**MJ1ABB**, Barranquilla, Colombia, 6,115 kc. Signed at 12:25 p.m. with chimes (Williams) heard 6-10 p.m. and 4,780 kc., (Alfred) 4,800 kc., (Fallon, Diez, Betances). Slogan: "La Voz de Barranquilla." Address: P. O. Box 715.

**HJ1ABE**, Cartagena, Colombia, 9,500 kc., heard 10-10:30 p.m. (Alfred), daily 5-10:30 p.m. (Hartzell, Dressler), 9,500 kc. (Diez, Eder, Lara, Coover). Slogan: "La Voz de Los Loboratorios Fuentes." Address P. O. Box No. 31.

**HJ5AB**, Cali, Colombia, 6,085 kc., heard 6 p.m. (Lara).

**HJ2ABC**, Cucuta, Colombia, 4,790 kc., heard 11:37 p.m. (Diez).

**HJ3ABX**, Bogota, Colombia, 6,122 kc., signs at 11 p.m. (Alfred). 5:30-11:30 p.m. (Hendry). Slogan: "La Voz de Colombia".

**HJU**, Buenaventura, Colombia, 9,510 kc., Monday, Wednesday and Friday, 12-2 p.m., 8-11 p.m. (from veri.) Williams. Slogan: "La Voz del Pacifico."

**HJ4ABH**, Armenia, Colombia, 9,520 kc., heard 9:05 p.m. (Eder) heard 10-10:30 p.m. (Alfred) chimes used (Smith) 6-10:30 p.m. (Hendry, Dressler, Jaime,) wants reports, (Lara, Kemp). Slogan "La Voz de Armenia."

**HJ4ABP**, Medellini, Colombia, 6,030 kc., heard 11-12 p.m. (Smith, Jaime,) 8 a.m.-11 p.m. (from veri) (Magnuson). Slogans: "Radio Emisora Philco," and "Broadcasting Station Claridad."

**HJ4ABE**, Medellin, Colombia, 6,097 kc., daily 11 a.m.—noon and 6-10:30 p.m. from veri. (Markersen).

**HJ4ABN**, Armenia, Colombia, 9,510 kc., Sunday 8-9:35 p.m. (Stabler). Slogan: "La Voz de Armenia."

**HJ4ABB**, Manizales, Colombia, 6,110 kc., heard 6 p.m. (Lara).

**HJ4ABL**, Manizales, Colombia, 6,070 kc., heard 6-8 p.m. (McCartin).

**OAX4J**, Lima, Peru, 9,320 kc., heard 11:18 p.m. (Beck, Eder, Alfred)) 6-11:30 p.m. (Hendry, Atkinson, Kernan, Randle, Lara). Daily 12-3 p.m. and 5-10 p.m. (from veri) (Markuson, Gallagher). Slogan: "La Voz del Peru Par Toda La America". Address: P. O. Box 1166.

**OAX5B**, Ica, Peru, 11,810 kc., heard irregularly to 11 p.m. (Alfred, Atkinson). 11,796 kc. changed call to OAX5A. heard 1:05 a.m. (Beck, Prosser, Hanis) 11,710 kc (Diez, Doyle, Lara, Millen).

**OAX4Z**, Lima, Peru, 9,565 kc. and 6,092 kc. (Harris) daily at 11:30 p.m. (Burt) 6,073 kc., heard 11:26 p.m. (Diez). Slogan: "Radio National".

**OAX1A**, Chiclayo, Peru, 6,150 kc., 8-11 p.m. (Doyle). Address P. O. Box No. 9.

**OCC2**, Lima, Peru, 18,680 kc., Tuesday at 5 p.m. All American Cables (Hartzell). Thursday, 5-5:15 p.m. (Fritsch).

**OC1**, Lima, Peru, 18,680 kc. 4:40-5:30 p.m. (Dressler).

**OAX4P**, Huancayo, Peru, 5,980 kc., (Lara). Slogan:: "Radio Huancago."

**OAX4Y**, Lima, Peru, 6,092 kc., heard 11:30 p.m. (Burt).

**OAX4I**, Lima, Peru, 9,433 kc., heard 11:15 p.m. (Diez) 9,330 kc., Wants reports, Daily 6-11:30 p.m., 12-2 p.m. and Sunday 12-3 p.m. (Welper). Slogan: "Radio National." Address: P. O. Box 1166.

**OAX4G**, Lima, Peru, 6,280 kc. heard irregularly (Diez), 6,269 kc. (Birnie).

**OAX4D**, Lima, Peru, 5,780 kc. (Doyle).

**CXA2**, Montevideo, Uruguay, 6,000 kc., heard 3:30 p.m. and 9:30 p.m. (Diez). Address: Rio Negro 1631.

**CXA4**, Montevideo, Uruguay, 6,125 kc., Saturday and Sunday, 10:30 a.m.-12:30 p.m. and 1:30-9:30 p.m. (Diez, Millen).

**PRF5**, Rio de Janeiro, Brazil, 9,500 kc. daily 4:45-5:45 p.m. (Alfred, Forshay, Doyle, Lara, Ruiz). Address: Co. Radio Internacional do Brazil.

**CB615**, **CEB**, Santiago, Chile, 12,295 kc., heard 7-8 p.m. irregularly, (Alfred) heard 4 p.m. (Unger), 12,235 kc. (Diez, Lara, Millen), daily 6-8 p.m. (Hartzell).

**CB960**, Santiago, Chile. 9,600 kc., daily at 8 p.m. (Lara). Slogan: "Difusora Pilot."

### West Indies

**COGF**, (COCQ?) Matanzas, Cuba. 11,800 kc., (Sahlbach). 12:24-1:45 a.m., (Patrick), wants reports (Beck), daily 1:30-4:10 p.m., 7-10:07 p.m., (Alfred, Fallon, Alexander, Rosa), daily 5-10 p.m., (Dressler), relays CMGF, (Beck, Novas, Betances, Skinner, Markuson, Welper, Partner), daily 6-11 p.m., (Atkinson, Chambers, Duncan, Mechling, Davis, Tate, Dressler, Kemp, Magnuson, Umstead, Diez, Eder, Lindner, Kentzel, Povfer, Gallagher, Coover, Shamleffer, Gross, Hendry, Nigh). Slogan: "Radio Philco". Address: General Betan Court 51, owner is CO5RY (amateur).

**COCD**, Havana, Cuba, 6130 kc., until 1 a.m., (Alfred). (from veri.), (Williams, Duncan, Hendry), 6120 kc., (McCartin), daily 5 p.m.-1 a.m., (Randle, Duncan). Slogan: "La Voz del Aire," Address: P. O. Box No. 2294.

**COJK**, (**CO9JQ**) Camaguey, Cuba, 8665 kc., (Alfred), 7-12 p.m., (Fallon, Ralat, Utermahlen, Alexander, Umstead, Rosa, Eder, Williams), 7800 kc., Wednesday, 9-11:45 p.m., (Gallagher, Hartzell, Betances), 8140 kc., (Davenport, Lopez, Davis, Kemp, Jaime, Magnuson, Diez, Eder, Lindner, Doyle, Poyfer). Slogan: "Zenith Radio."

**COCQ**, Havana, Cuba. 9750 kc., daily 7 a.m.-12 midnight, (Alfred, Prosser, Dressler, Wollenschlager, Oglesby, Chagaris, Wacker, Diez, Eder, McGowan). Slogan: "De la RCA Victor."

**COCX**, Havana, Cuba. 11,435 kc., 8 p.m.-1 a.m., (Alfred, Prosser, Eder), 11,490 kc., daily.

# 10-20 Meter Transmitter

(*Continued from page* 148)

varies in a like degree the voltage flowing into the primary of T8 (Unit F). As there is still a 50% drop in voltage even during modulation peaks auto-transformer T14 is necessary to bring the primary voltage for T8 back to the normal 115 volts during these peaks. The "amp. sw." is so wired that both the autotransformer and the variactor are automatically cut into the circuit properly when this switch is thrown to the right-hand position. The operation of the transmitter under controlled-carrier conditions will be fully covered in the next article.

Remaining on Unit C are now but four relays and transformer T18. These relays supplement the several switches on this unit so that the entire transmitter may be remotely controlled from the master control position in Unit N (Figure 1). Two of these relays are for this remote control, while the other two are for protection purposes.

Transformer T18 supplies 6 volts of a.c. to operate the entire relay system. When the master-control switch on Unit N is closed, 6 volts is run into the coil of relay No. 4. This in turn feeds 110 volts into the coil of relay No. 3. This relay is designed so that the contacts will safely break 25 amperes and is cut into the a.c. circuit ahead of the plate switches LV, MV and HV. This takes care of the remote control of the plate power, not only of the r.f. cabinet but also the plate power of the a.f. cabinet, the a.f. cabinet also having a pair of relays identical to Relay No. 3 and Relay No. 4.

Relay No. 5 and Relay No. 6 are the two protective relays of the r.f. cabinet being, respectively, overload and underload relays. The coils of both these relays are hooked in series with the minus h.v. lead, this lead entering Unit C through post T and leaving through post M. The overload relay is set so that, when the plate current of the HF-200's exceeds 500 ma. its contacts will open. As the contacts of this relay are in series with the master-control switch, excessive plate current on the HF-200's will immediately shut off all plate supplies in both the r.f. and a.f. cabinets. The small knob in the lower center of the panel of Unit C will reset the overload relay after this occurence, the relay being of the self-locking type.

The underload relay is connected only in the 6-volt control circuit leading to the a.f. rack. This relay can be set so that its contacts will not close until the plate current on the HF-200's reaches a predetermined value. When the plate current exceeds this value the contacts of the underload relay close, actuating the control relays in the a.f. cabinet. When the plate current of the HF-200's falls below this value the power supplies in the a.f. cabinet are automatically shut off. This prevents the 822 modulators working into a low value of load, or no load at all. If this protective underload relay were not to be used the modulation output transformer could possibly burn up from the extremely high peak audio voltages that the 822's would generate across it in the no-load condition.

With the power supplies and control unit out of the way the two r.f. Units A and B may be constructed, Unit B being first constructed as Unit A, the final amplifier, is inoperative without Unit B to properly excite it. We have, so far, built the complete power equipment and the means to properly and easily control this equipment for the two r.f. units. Only the actual radio-frequency stages remain to be constructed before the complete r.f. cabinet is ready to test and place on the air.

The actual r.f. lineup begins at the left of the diagram of Unit B (Figure 2). At the left are three crystals, X, X1 and X2 and their switch. Each of these crystals work on the same band, this being 40 meters, but their exact frequencies are 5 kc. apart. The crystal frequencies used in this particular transmitter are 7095, 7100 and 7105 kc. This provides selection of three frequencies which are 10-kc. apart, when operating on 20-meter phone, and 20-kc. apart when operating on 10 meters. These frequencies are close enough together so that it is not necessary to retune any circuits when shifting from one frequency to another. This makes possible an instantaneous jump to any one of three closely adjacent frequencies in order to escape QRM—or in order to avoid causing needless QRM to some other station.

A single RK-34 is used for the first two r.f. stages. This tube is a dual-triode, with common cathode, expressly built for high-frequency transmitter operation. One section of the tube is used as the 40-meter crystal oscillator, with C12 and L9 comprising its tank circuit. This coil is the rearmost of the two Hammerlund plug-in forms in the photo. C12 is one of the type APC air trimmers and is mounted inside of the coil form with a small screw, the condenser and form being designed for this type of mounting. The use of "screwdriver tuning" on this oscillator stage is permissible as once this trimmer is properly set it need not be touched again.

The second section of the RK-34 is the twenty-meter doubler stage. Another Hammerlund plug-in form is used for this plate coil but the plate condenser, C15, is turned from the right-hand dial on the panel. The crystal switch is directly under this dial. It will be noticed that C15 does not connect directly across the coil, L10, but does this through by-pass condenser C14. This circuit dodge makes it possible to mount C15 directly on the panel in a single-hole mounting. It must be remembered that in this type of plate circuit, C14 is also a part of the tank circuit, and must therefore be mounted so that the leads from it to C15 and L10 are as short as possible. As the plate leads of the RK-34 are brought out through caps at the top of the tube a pair of small feed-through insulators are used to bring these leads below the chassis. The front insulator of this pair also connects to the stator of C15, forming the tank lead down to the "hot" end of L10.

The RK-25 is just to the right of the RK-34 (referring to the rear view photo of Unit B). Its plate tank coil is mounted close to the panel directly over its tuning condenser C19. This condenser is, like C15, mounted on the panel with a single-hole mounting. The center dial on the panel tunes this condenser. In order to raise the coil high enough to clear the tuning condenser the two jack-type stand-off insulators supporting this coil are mounted about an inch or so above the chassis by means of long 6/32 bolts and bushings. By-pass condenser C26, which is part of this plate-tank circuit, connects between the frame of the tuning condenser and the right-hand stand-off insulator. The left-hand insulator, supporting the "hot" end of L11, goes to the plate cap of the RK-25 through a flexible lead and to the plate meter, M3, through an r.f. choke. The other side of the meter is brought below the chassis by a small feed-through insulator, which may be seen just to the right of the RK-25.

This open type of construction for the RK-25 plate-tank is advantageous in several ways. It not only permits very short

tank leads but also permits the use of an air-wound coil, mounted away from the chassis. This is essential as the RK-25 must operate with its plate circuit tuned to 10 meters when operating the transmitter on this band. This construction also permits the excitation lead to the grid of the RK-38 to be tapped on the coil at any desired turn for correct impedance match between the two stages.

The RK-38 driver stage takes up the entire right-hand end of the chassis of Unit B. The rear-view photo shows all component parts quite plainly. The plate-tank condenser C24, which is of the split-stator type, is mounted upside down on the chassis by means of four small brackets. As the condenser is mounted toward the rear of the chassis it is necessary to use an extension shaft to connect to the dial. This is done by means of a G.R. panel bushing, a short piece of bakelite or metal ¼ inch shafting, and a shaft coupling. The coil, L12, plugs into a pair of jack-type feed-through insulators, which are mounted on a piece of hard rubber. This hard rubber piece is in turn fastened to the tuning condenser frame by means of a pair of 6/32 bolts and bushings. The pair of holes on the condenser frame which are used to hold these bolts are already drilled and tapped for 6/32 bolts.

In order to eliminate a center-tap on this coil, shunt feed is used on the RK-38. The threaded end of the plate r.f. choke is screwed directly on the end of a small feed-through insulator, this insulator serving both to mount the choke and to bring one connection of it down through the chassis. The upper end of the choke goes to the RK-38 plate cap through a flexible lead and to the front end connection of the coil through blocking condenser C22A. The plate meter for this stage, M4, connects below the chassis through a pair of small feed-through insulators.

To the left of the RK-38 and the neutralizing condenser may be seen two small insulators, one of the feed-through type and the other of the stand-off type. The former brings the end of the grid leak R22 up through the chassis, the Grid choke RFC4 connecting between these two insulators. The stand-off insulator is used as the common grid connection post. Not only is one end of RFC4 supported by it, but also the grid-feed condenser C20, the other end of this condenser running through a flexible lead and clip to the RK-25 plate-tank coil. This common grid post also connects to the side grid cap of the RK-38 through a very short flexible lead. It is advisable to loop this lead slightly, as shown, so as to place no undue strain on the grid cap of the tube.

The neutralizing condenser C23 hooks in as shown in the photo, the upper plate to the rear stator connection of the plate-tuning condenser while the lower plate goes to the "common grid post." This business of tying loose leads to a substantial support always makes for a good solid construction job. Extra insulators, either of the feed-through type or the stand-off type, mounted under or below the chassis furnish an inexpensive and simple method of tying down these various loose leads and parts. This is especially important in the case of small components, such as by-pass condensers and r.f. chokes, which must be supported by their leads.

The next, and last, unit to be constructed in the r.f. cabinet is Unit A, the final r.f. amplifier. While all parts and units of the entire transmitter are, of course, important this Unit A is actually the most important piece of equipment. All other units are both secondary and complimentary to this unit. These other units have but five functions, all of which are important only in their relation to the final amplifier. These units light up the final amplifier tubes, furnish filtered direct current at the necessary high voltage, excite the tubes at the proper frequency, modulate the input to the amplifier in accordance to the speech tones and last, but not least, they control, through various switches and relays, all the various voltages and currents furnished by them to the final amplifier. It will be apparent, then, that the design of the final amplifier comprising Unit A is of the utmost importance. As a matter of fact, it took the best part of two days before arriving, by the process of elimination, at the particular mechanical and electrical layout used in Unit A; actually, no other physical arrangement of parts can be found to provide a symmetrical layout in the space available.

Two items are of most concern in designing this unit; first, short leads, especially in the tank circuit; second, symmetry of layout; the latter because this stage is push-pull, imposing the requirement of a perfectly-balanced circuit if the advantages of push-pull are to be realized.

The few components of this stage are clearly shown in the photos. It will be noticed that the upper sections of the two neutralizing condensers are very close to the stator assemblies of the tuning condenser C27. Actually, however, the upper plate of each neutralizing condenser connects directly to the stator assembly immediately above it, so that the adjustment screws of the neutralizing condensers could actually touch the stator plates of the tuning condenser without causing trouble.

The assembly and wiring of this stage is as simple as the photo shows. The only piece of "special construction" is the mounting of the plate coil. A pair of Johnson large-size insulators supports a small piece of hard rubber, which in turn supports the Coto mounting base. A center tap is used on this coil, this tap being previously taken care of in the coil construction. An antenna link is also built into the coil assembly, the two terminals of the link being brought out to a pair of plugs on the coil base. This link is the new variable-coupling type. The mounting base is of the five-jack type to accommodate the several connections.

The r.f. choke, RFC6, is somewhat hidden in the photo, being slung horizontally under the hard-rubber strip. One end of this choke is supported by a 3-inch Coto insulator, while the other end mounts with a stiff piece of buss to the stand-off insulator supporting the blade of the "fone-c.w." switch. A feed-through insulator supports the other terminal of this switch, at the same time bringing the high voltage up to the switch. This switch is merely a porcelain-mounted knife switch which has been remounted by drilling and tapping it to screw on the insulator bolts.

The connection wires to this "fone-c.w." switch and to the link terminals of the plate coil are not shown in any of the photos. These are merely flexible leads which run up to the four feed-through bowls mounted in the top of the cabinet. The two leads for connection to the switch fasten to the screws on the mounting jaws of the switch.

In the rear view photo the 10-meter coil is shown in place. This coil originally had six turns. It was found, however, that the greater dimensions of components necessary in an amplifier stage of this power made it impossible to tune down quite to ten meters with the original coil. This was remedied by removing the two end turns, bringing the total down to four turns. This may be easily accomplished with pliers and cutters by exercising a bit of care. The two supporting insulators should be sawed shorter on each end as the final operation.

The connections to the tubes are too

plainly shown in the photos to require any explanation. Although the two cross leads from the grid-terminal insulators to the lower plates of the neutralizing condensers appear to be touching, this is not so; actually they are bent so as to clear by about ⅛ of an inch. The four connections to the grid and plate caps of the HF-200's should be made of flexible wire and looped slightly to prevent the strain on these caps which would otherwise appear as the tubes heated during operation.

The two meters, M5 and M6, do not show in the rear-view photo, being hidden by other parts. The leads for these meters are run below the chassis by means of two pairs of feed-through insulators. It will be seen, by study of the diagram, that the plate-current meter M5 is in the negative lead from the power supply, rather than the positive lead. This procedure keeps the "works" of this meter at ground potential. This negative high-voltage lead has rather an interesting journey throughout the several units. It begins down in Unit F, comes up through Unit E via lead T up to control Unit D. Here it runs through the overload and underload relays and continues via lead M to ground in Unit A, going through M5 in the process. From ground this negative lead continues through keying relay No. 7, and cathode resistor R24 to the center-tap of the HF-200's, terminating in resistor R24A. With meter M5 connected in the circuit as it is this meter reads only the plate current and not the combined plate and grid currents. M6 reads only the grid current.

The only remaining points of construction to be cleared up are the antenna circuit, lead-in bowls in the top of the cabinet and the protective door switch, which we forgot to mention previously. This switch mounts on the back edge of the cabinet so that it will close only when the door is closed. It breaks the 6-volt control system, as shown at the left of Figure 2, so that the entire relay-control circuit is dead with the door of the r.f. cabinet open. As this action opens all plate-power transformers, all voltage higher than the 115-volt line is completely off all units until the door is again closed. This is an important safety feature in a transmitter of this power. Opening the door of the r.f. cabinet also throws off the power supplies in the a.f. cabinet. This prevents the modulator stage from operating without load, a practice we previously pointed out as being dangerous to equipment.

The four National bowls are mounted in the top of the cabinet by sawing out a rectangular piece and replacing it with a slightly larger piece of hard rubber which has these bowls mounted thereon. Four bolts hold this piece of hard rubber in place. Use of this piece provides additional clearance between the leads coming through these bowls and the steel top of the cabinet.

The two antenna thermocouple ammeters, not shown on the diagrams, merely connect between the two antenna bowls and a pair of stand-off insulators mounted at the center rear of the cabinet top. These meters are of the type which use external thermocouples. The meters proper are connected to these thermocouples by means of twisted leads; these leads must be kept to their original length if the calibration of the meters is to be retained.

The thermocouples are mounted on these two rear stand-off insulators, while the meters are mounted on a piece of hard rubber. This piece is supported from the cabinet top with a pair of small right-angle brackets. This method of construction eliminates the r.f. losses, and possible meter burn-out, which would result if the meters were mounted directly on a metal panel.

Operating instructions for this r.f. cabinet will be reserved for a future article; the constructor will not be ready to test the transmitter for a couple of months anyway.

## Parts List for Final Amplifier Unit A

2—type HF-200 tubes, Amperex (V14, V15)
2—type 211 sockets, Johnson
C27—National type TMA-40DC split-stator tuning condenser
C28, C29—National type NC-150 neutralizing condensers
R24—Ward Leonard 750-ohm 100-watt resistor with slider
R24A—100-ohm CT. filament resistor, Ward Leonard
RFC6—Hammarlund type CH 500 r.f. choke
RFC7, RFC8—Hammarlund type CH X r.f. choke
L13—Coto TVL series variable link coils
Rel7—6-volt a.c. coil, 4-amp. contact, keying relay, Ward Leonard
M5—Triplett 4" square case meter, 0-750-ma., d.c.
M6—Triplett 4" square case meter, 0-150-ma., d.c.
Coto type CI-8TLM mounting base
2—Johnson 4½" high insulators
1—Coto 3 inch type C1-30 stand-off insulators
6—Birnbach type 478 feed-through insulators
10—Birnbach type 4125 feed-through insulators
1—Birnbach type 866 stand-off insulator
1—Birnbach single-pole-single-throw knife switch
R24B—Ward Leonard 4000-ohm 100-watt resistor with slider
C27A—.01 mfd.-1200-V working Cornell-Dubilier type 9 mica condenser
1—General Radio type 717-A 4" dial
1—14"x19" black crackle aluminum panel, Parmet
1—11"x17"x2½" cadmium-plated chassis, Parmet
1—pair of chassis mounting brackets, Parmet

## Parts List for Unit B

X—Leeds type LD5 70 95-kc. mounted crystal
X1—Leeds type LD5 7100-kc. mounted crystal
X2—Leeds type LD5 7105-kc. mounted crystal
VII—Raytheon type RK-34 tube
V12—Raytheon type RK-25 tube
V13—Raytheon type RK-38 tube
2—Hammarlund type S7-prong isolanite sockets (large)
2—Hammarlund type S4 4-prong isolantite sockets
4—Hammarlund type S5 5-prong isolantite sockets
C10—CD .01-mfd. 600-V working type 9 mica condenser
C11—CD .01-mfd. 600-V working type 9 mica condenser
C12—Hammarlund type APC25 trimmer condenser
C13-CD .0001-mfd. 600-V working type 9 mica condenser
C14-CD .002-mfd. 600-V working type 9 mica condenser
C15—Hammarlund type MC-50-S tuning condenser
C16-CD .01-mfd. 600-V working type 9 mica condenser
C17—CD .01-mfd. 600-V working type 9 mica condenser
C18—CD .004-mfd. 600-V working type 9 mica condenser
C19—Hammarlund type MC-50-SX tuning condenser
C20—CD .0001-mfd. 1200-V working type 9 mica condenser
C21—CD .01 mfd. 600-V working type 9 mica condenser
C22—CD .01 mfd. 600-V working type 9 mica condenser
C22A—CD .001 mfd. 2500-V working type 9 mica condenser
C23—National type NC-800 neutralizing condenser
C24—Hammarlund type TCD-50-A tuning condenser, split-stator
C25—CD .0001-mfd. 600-V working type 9 mica condenser
C26—CD .002-mfd. 600-V working type 9 mica condenser
R15—Ward Leonard 2000-ohm 25 watt resistor
R16—Ward Leonard 10,000-ohm 50-watt resistor
R17—Ohiohm 10,000-ohm 1-watt resistor
R18—Electrad wirewound 50,000-ohm potentiometer
R19—Ohiohm 15,000-ohm 1-watt resistor
R20—Ward Leonard 50,000-ohm 25-watt resistor
R21—Ward Leonard 15,000-ohm 25-watt resistor
R22—Ward Leonard 10,000-ohm 25-watt resistor
R23—Ward Leonard 100-ohm CT fil. resistor
RFC—Hammarlund type CHX r.f. choke
RFC1—Hammarlund type CHX r.f. choke
RFC2—Hammarlund type CHX r.f. choke
RFC3—Hammarlund type CHX r.f. choke.
RFC4—Hammarlund type CHX r.f. choke
RFC5—Hammarlund type CH500 r.f. choke
L9—osc. plate coil, Hammarlund SWF4 coil form (see coil chart)
L10—dblr. plate coil, Hammarlund SWF5 coil form (see coil chart)
L11—buf. plate coil airwound (see coil chart)

L12—driver plate coil small GR form 677U and airwound (see coil chart)
M3—Triplett 4" square bakelite case meter, 0-100-ma., d.c.
M4—Triplett 4" square bakelite case meter, 0-300-ma., d.c.
1—14"x19" black crackle aluminum panel, Par-met
1—11"x17"x2½" cadmium plated chassis. Par-met
1—pair of mounting brackets for above, Parmet
3—General Radio type 717A 4" dials
3—small bar knobs
1—SPST rotary toggle sw. (buffer sw.)
1—Yaxley single-gang, single-circuit, 5-point switch (x'tal sw.)
7—Birnbach type 4125 feed-through insulators
7—Birnbach type 478 feed-through insulators
1—Birnbach type 866 stand-off insulator
4—Birnbach type 866J stand-off insulators jack-type
8—Birnbach type 401 plugs

## Parts List for Unit C

R14—Ward Leonard 12-ohm heavy-duty filament rheostat
M2—Triplett 4" square bakelite case meter, 0-15-a.c.-volts
T15, T18—UTC type PA27 6.3-V filament transformer
T14—UTC type AV6 controlled-carrier auto-transformer
T16—UTC type CS-405 fil. transformer, 5-V at 20-amp.
T17—UTC type filament transformer 10½-V.
REL3—Ward Leonard 115-V a.c. coil, 25-amp. contact DPST relay
REL4—Ward Leonard 6-V a.c. coil, 4-amp. contact DPDT relay
REL5—Ward Leonard 500-ma. coil, overload relay
REL6—Ward Leonard adjustable ma. coil, underload relay
4—SPST 15 amp. toggle switches
1—Vitrolex 2-pole 6-throw switch (amplifier sw.) (Communication Prod.)
2—General Radio 2⅜" knobs with skirts, type 637-R
28—Birnbach type 4125 feed-through insulators
1—8¾"x19" black crackle aluminum panel, Par-met
1—11"x17"x2½" cadmium plated chassis, Par-met
1—pair of brackets for mounting above, Parmet

## Parts List for Unit D

V10—Raytheon type 83 tube
1—Hammarlund type S4 4-prong isolantite socket
C6—CD 2-mfd. 2000-volt working filter condenser
C7—CD 2-mfd. 2000-volt working filter condenser
C8—CD 2-mfd. 1000-volt working filter condenser
C9—CD 2-mfd. 1000-volt working filter condenser
R13—Ward Leonard 50,000-ohm 160-watt resistor
L6—UTC type CS-304 200-ma. swinging filter choke
L7—UTC type CS-301 200-ma. smoothing filter choke
L8—UTC type CS-301 200-ma. smoothing filter choke
T11—UTC type PA-116 1400-0-1400 at 200-ma. power transformer
T12—UTC type CS-200 450-0-450 150-ma.
T13—UTC type CS-48 5-volt 4-amp. fil. transformer
1—8¾"x19" black crackle aluminum panel, Par-met
1—11"x17"x2½" cadmium plated chassis, Par-met
1—pair of brackets for mounting above, Parmet
7—Birnbach type 4125 feed-through insulators

## Parts List for Unit E

V6, V7, V8, V9—Raytheon type 866A tubes
4—Hammarlund type S4 4-prong isolantite sockets
R9, R10, R11, R12—Ward Leonard 25,000-ohm 50-watt resistors
L4—UTC type PA-109 500-ma. swinging filter choke
L5—UTC type PA-108 500-ma. smoothing filter choke
T9—UTC type PA-120 2½-V. 10 amp. fil. transformer
T10—UTC type PA-34 2½-V. 10 amp. fil. transformer
1—8¾"x19" black crackle aluminum panel, Par-met
1—11"x17"x2½"cadmium plated chassis, Parmet
1—pair of brackets for mounting above, Parmet
13—Birnbach type 4125 feed-through insulators

## Parts List for Unit F

C4—CD 2-mfd. 3000-volt working filter condenser
C5—CD 2-mfd. 3000-volt working filter condenser
T8—UTC type PA-114 3000-2500-0-2500-3000 500-ma. power transformer
1—7"x19" black crackle panel, Parmetal

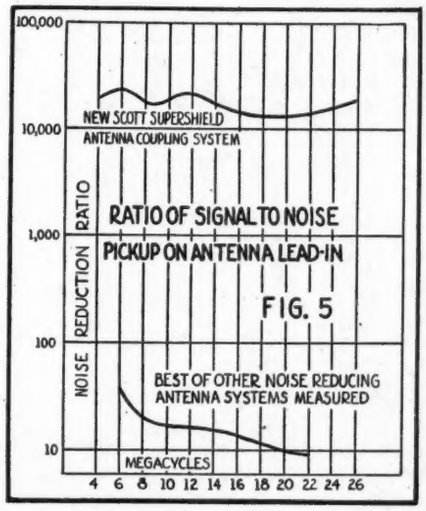
## R.F. Cabinet and Accessories

1—Parmetal Deluxe cabinet
2—Hammarlund type S4 4-prong isolantite sockets
1—dual a.c. outlet, with mounting plate
1—blank mounting plate
1—door switch
4—National type XS-2 Steatite high freq. bushings
2—Birnbach type 866 standoff insulators
2—Triplett 4" square bakelite case 0-5 amp. r.f ammeters

# The "Philharmonic"

(*Continued from page* 157)

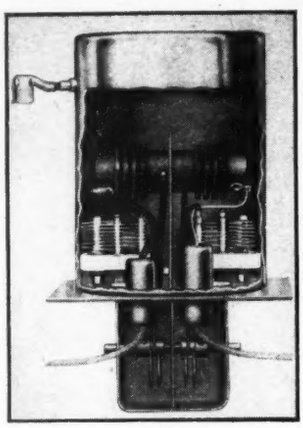
not permit discussion of all the refinements and special developments incorporated in this receiver but there are a few which are so outstanding as to demand mention. The built-in, noise-reducing antenna coupling system, for instance, is so effective, due to the use of a perfectly balanced, and electrostatically shielded circuit that noise picked up in the lead-in is reduced in a ratio of better than 10,000 to 1, as shown in Figure 5. This applies when a good doublet antenna is employed, and over the range of 4 to 25 megacycles. In actual operating tests, electrical interference near the lead




in, and so intense as to make short-wave reception impossible on another equally well shielded receiver, was reduced to such an extent that it did not cause the slightest interference on any but extremely weak signals when the Scott receiver was switched in.

In addition to its noise reducing feature, this antenna coupler also provides an unusually efficient transfer of signal energy from the antenna to the first r.f. tube. This is illustrated in the curves of Figure 6 which show measurements made over the two most important short-wave ranges—4 to 10 megacycles, and 10 to 26 megacycles.

A tremendous range of selectivity and audio-frequency response is provided in the "Philharmonic." At the one extreme channel-splitting selectivity is provided with sharp cut off of audio frequencies above 2000 cycles and a correspondingly radical reduction of noise in the reception of weak signals. At the other extreme true high-fidelity reproduction is obtained, with the response extending well beyond that employed by the best broadcast stations. In fact, by the addition of two high-frequency loudspeakers, connections for which are provided, audio frequencies up to the limit of human hearing (16,000 cycles per second) are included. The single high-fidelity, 15-inch speaker provided with the receiver is more than adequate, however, for the complete musical range of the best broadcasting. This is demonstrated by the curve of Figure 4.



ONE OF THE I. F. TRANSFORMERS

*This cut-away view of one of the "Philharmonic" i.f. transformers conveys some idea of the attention given to details. The vertical line in the center is the electro-static shield plate between primary and secondary circuits. The small can below contains the band widening condensers which are ganged to the "fidelity" control. Note that even the by-pass condensers have their "hot" ends enclosed within the coil shield.*

The variable band-pass characteristics of the i.f. amplifier, as shown in Figure 1, might be considered as the foundation of the system. This shows the i.f. band width for 4 positions of the "selectivity-fidelity" control on the front panel. The flattening off, progressively apparent in Curves B, C and D, is accomplished by means of small air condensers ganged to the fidelity control. These stagger the tuning of six of the i.f. circuits, each by a predetermined amount so that the combined result is a flat-topped, steep sided characteristic.

To prevent the three tuned r.f. circuits from limiting the over-all band width, due to their selectivity, a switch is automatically thrown when the "sensitivity-fidelity" control is advanced past a certain point, cutting in a band-pass filter in the r.f. amplifier and changing its response characteristic as indicated in Figure 3.

In addition to these functions the "selectivity-fidelity" control operates a variable filter network in the audio system. All these operations combine to provide a virtually perfect system of fidelity control-complicated in design but supremely simple to operate. This one control, plus the "Bass" control permit a balance of treble and bass to suit any ear or any type of program. The complete range of variation is shown in Figure 2.

The volume expansion system incorporated in the "Philharmonic" overcomes the drawbacks of so many of the earlier expansion systems, in that it provides a wide range of expansion (15 decibels) *without introduction of distortion!*

The needle-scratch suppressor system is another feature of this receiver which provides almost unbelievably realistic reproduction from phonograph records by suppressing the mechanical sounds of "surface scratch." It is accomplished by means of a filter which is automatically cut in and out of the circuit by varying volume. This filter is one that suppresses the higher audio frequencies which constitute the scratch.

The novelty and effectiveness of the new Scott system lies in an automatic cut out circuit which leaves the filter operative only during the reproduction of softer passages.

# The "Tiny-Tot"

(*Continued from page* 153)

1500 ohm, 2 watt resistor (R-10) in the plate circuit may be omitted. This resistor is for the purpose of dropping the voltage to the receiver and, together with C12, provides additional filtering to eliminate any last trace of ignition noise or generator hash which might be left on the line.

The grid leak is subject to variation with slight changes in wiring, ground connections, etc. In general, a higher leak gives greater audio response and sensitivity. If it is carried too far, however, the improvement ceases and the super-regeneration loses its smooth operating characteristics; the detector plate will require greater voltage and with constant readjustment of the regeneration control as the tuning is varied. If this circuit is properly adjusted the entire 5-meter band can be covered without readjusting the regeneration control.

Complete control of both transmitter and receiver from the small receiver panel is provided and allows the transmitter and power supply to be placed elsewhere in the car where space is not at a premium, such as in the rear trunk or under the hood. Note that no controls are provided for turning on or off the six-volt supply to the power supply and transmitter. In the case of any sizable transmitter the current drain is too heavy to lead about the car through plugs and switches without incurring a serious voltage drop which would greatly impair the efficiency of the oscillator if, indeed, it did not prevent it from functioning altogether. Heavy leads should be run directly from the storage battery to the transmitter and power unit and kept as short and direct as possible.

A series dropping resistor and filter condenser is included in the receiver filament circuit to supply current to a single button microphone when a storage battery is used. The exact size of this resistor will depend somewhat on the microphone used and whether or not a stage of speech amplification is incorporated in the modulator. If the microphone works directly into the modulator tube a smaller resistor of one to three hundred ohms will be preferable to allow greater modulation.

One side of the car battery is already grounded and the negative side of the high voltage supply is tied in on this grounded side of the A supply which also serves as the microphone return circuit. The on-off switch is placed in the "hot" 6-volt lead so that the microphone circuit is turned off together with the filaments and dial light.

The chassis and front panel are made from a single piece of metal which may be cut out of aluminum or thin steel, drilled and bent to shape in accordance with Figure 2, or the chassis and cabinet can be obtained, completely formed and drilled, in black crackled finish, from the Korrol Mfg. Co., Inc.

Note that the tuning condenser is mounted backward; that is, it is driven from the rear end instead of the regular shaft. Some of the midget condensers make provision for this by extending the ¼-inch shaft right through. In the case of the particular one used this is not done and it is necessary to solder a short length of ¼-inch o.d. bushing to the rear end of the shaft. A flexible coupling is then used to connect this to the bakelite or hard rubber rod which extends to the tuning dial.

Another insulating rod is used to vary the small isolantite, compression type, antenna coupling condenser. This rod is drilled at the back end so that it fits tightly over the screw adjustment of the condenser. A fine hole should be drilled through the rod and adjustment screw which can then be pinned together with a piece of hard wire. Choose a compression condenser with the lowest minimum capacity you can find —never mind the maximum as it will be large enough.

The 4 mfd. condenser is mounted on the tube side of the back panel together with the tone adjusting mica condenser which is connected from plate to ground of the output tube. This permits the latter to be varied easily after the wiring is finished. Place the other large condensers and the 2-watt resistor side by side at the bottom of the chassis and connect them to their proper points before mounting the variable condensers. It is best to leave the condensers and tuning inductance till the last so that you will not have to work around them with the wiring.

The tuning inductance is mounted directly on the condenser and consists of ten turns of No. 14 hard-drawn copper wire, ½-inch i.d. This coil should be wound with no spacing and then stretched out until the spacing equals about half the wire's diameter. This allows room for further stretching, if necessary, for final adjustment.

Note that there are two taps on the tuning inductance. The r.f. choke is connected to its center and placed at right angles to it. The antenna coupling condenser is connected directly to the 50 mmfd. grid condenser which, in turn, is connected to the tuning inductance three turns down from the grid end. This provides a better match for the tube's input impedance than connecting directly to the top of the coil, improving both sensitivity and selectivity.

Two plates, one rotor and one stator, should be removed from the tuning condenser. The parasitic capacities in this layout are so low that even with two plates removed from the 15 mmfd. tuning condenser there will still be a greater tuning range than necessary for the 5-meter band and if maximum bandspread is desired the remaining condenser plates may be opened up a bit.

The r.f. choke may be one of the small, ultra-high frequency variety which are now obtainable, or may be wound by using fine, silk insulated wire on one of the old glass type grid leaks. It is not critical. Number 34 wire, tight wound to within about ⅛-inch of each end will be satisfactory.

Success with any type of ultra-high-frequency receiver is largely dependent on careful and painstaking attention to details. No matter how carefully a circuit and layout has been planned, sloppy wiring or a touch of soldering paste can make the difference between a receiver that is 'tops' or just another radio set. If this little job is well built and carefully wired, the writer promises you that unless you have a very exceptional 5-meter receiver at your home QRA you will be using it there as well as for your mobile work. It takes a really *good* superhet to lick it.

## Parts List

C1 (see text)
C2 Hammarlund type HF-15 midget variable condenser, 3-17.5 mmfd. (see text)
C3 Solar mica condenser, 50 mmfd.
C4 Solar mica condenser .003 mfd.
C5 Mallory tubular paper condenser, .01 mfd.
C6 Mallory type CS130 cardboard electrolytic 2 mfd., 450 v.
C7 solar mica condenser 500 mmfd.
C8 Mallory tubular paper condenser, .01 mfd.
C9 Mallory type TN-112 dual electrolytic condenser, 5-5 mfd., 35 v.
C10 Solar mica condenser, .006 mfd.
C11 Mallory type CS130 electrolytic, 2 mfd., 450 v.
C12 Mallory type CS131 electrolytic, 4 mfd., 450 v.
L1, L2 (see text)
R1 IRC resistor 50,000 ohms, ½ watt
R2 Yaxley 50,000 ohms potentiometer with on-off switch

R3 IRC resistor 75,000 ohms, ½ watt
R4 IRC resistor 7 megohms, ½ watt
R5 Yaxley potentiometer, 5 megohms
R6 IRC resistor 2500 ohms, ½ watt
R7 IRC resistor 50,000 ohms, ½ watt
R8 IRC resistor .25 megohm, ½ watt
R9 IRC resistor 600 ohms, 1 watt
R10 IRC resistor 1500 ohms, 2 watts
R11 IRC resistor 600 ohms, ½ watt
SW1 Rotary switch, s.p.d.t.
1 National type BM, small illuminated vernier dial, scale 0-100-0
1 Korrol special chassis and cabinet (see text)
1 Yaxley Junior headphone jack, type 704A
1 Eby 7 prong wafer socket
1 Eby 7 prong male cable plug
2 Eby octal wafer sockets
1 National octal Isolanite socket
1 antenna twin connection strip
2 pin jacks with insulated bushings
4 small pointer knobs

## 16-Tube Super

(*Continued from page* 151)

6000 to 16,000 kilocycles, and 12,000 to 30,000 kilocycles.

The receiver will deliver 5 watts of undistorted output and 8-watts maximum.

The most interesting feature of the receiver is the noise suppressor. This is designed to reduce interference from machines such as car ignition, and other electrical devices that cause considerable disturbance, particularly at the higher frequencies. This unit consists of a 6J7 tube whose plate circuit shunts the input circuit of the audio amplifier driver stage and a means of making the shunting plate impedance very high for desired signals and very low for undesired noise impulses of short duration and amplitude greater than the desired signal.

Another interesting feature is the noise limiter. This consists of making use of the second diode of the 6H6 which is placed in shunt with a resistor with its anode biased approximately 20 volts negative with respect to the cathode by means of a bleeder resistor. As a result excessive signals or bursts of static of magnitude great enough to cause the voltage across the resistor to exceed approximately twenty volts will cause the noise limiter diode to draw current, or present a low impedance across the resistor, thereby acting as a noise limiter.

The crystal filter is connected in the first of the two 460 kc. i.f. stages. It provides a high degree of selectivity, particularly for c.w. reception, although it was found quite effective on 'phone signals. When properly adjusted for a given signal little distortion was introduced; interfering signals within a kilocycle could be completely dropped out with only slight attenuation of the desired signal. On c.w. the crystal had practically no affect on strength of the incoming signal when the receiver was tuned properly, although the tuning adjustment was quite critical, which is a desirable feature. It was possible to obtain 50-cycle selectivity on this class of reception.

One of the desirable electrical features is the use of electrical band-spread. This consists of a separate four-unit condenser for the band-spread dial which is designed to cover ten percent of any portion of a main dial. This is adequate for covering any of the higher-frequency amateur bands, although on the 80- and 160-meter bands it will not quite cover the entire band. However, on these bands the main tuning dial may be used without discomfort and the band-spread dial for critical tuning. Another desirable electrical feature is the use of two stages of pre-selection on all bands. This adds to the sensitivity considerably and by increasing the signal input reduces background noise to practically nothing.

Another interesting feature is the use of the calibrated signal input control in conjunction with the 6E5 tuning indicator to obtain the approximate value in microvolts of any signal delivered to the receiver. This is done by tuning the receiver to a given signal by means of the resonance indicator and then reducing the signal input by means of the control until the "electric eye" is caused to be deflected only $\frac{1}{8}$ inch. The sensitivity control or signal input dial will then read the approximate signal input in microvolts. The scale readings are multiplied by five for the highest frequency band which includes both the 10- and 20-meter amateur bands.

The a.v.c.-c.w. switch is a 5-position unit which may be set for: modulated signals without a.v.c., modulated signals with a.v.c.; stand-by c.w. signals with a.v.c. and c.w. signals without a.v.c When set for either of the two c.w. positions it connects in the beat oscillator.

The receiver is designed for best results with a doublet antenna, although an antenna and ground arrangement may be used if desired. A coupling transformer should be used if a doublet antenna with a twisted-pair feeder line having an impedance of about 70 ohms is used. The receiver is carefully shielded, so that when a doublet antenna is used there is practically no pick-up from adjacent apparatus. Where the loudspeaker and power wires pass through the chassis, sliding covers are provided to keep the openings at a minimum and at the same time permit removing the receiver from the cabinet.

The receiver recently was given a test under practical operating conditions at the writer's station, W2MW, at Bloomfield, N. J., and performed exceptionally well. One thing noticed during these tests was its selectivity without the crystal filter in use. On the normally crowded 75-meter amateur 'phone band it was possible to separate signals with ease which were badly QRM'd on a receiver that hitherto had been regarded as quite selective.

Sensitivity proved more than accurate, it being possible to receive signals with an R8 intensity that could barely be heard on another receiver equipped with one r.f. stage and one i.f. stage.

Background noise was practically nil under normal receiving conditions. On the 75-meter band stations in St. Louis and Chicago were heard consistently through local interference during summertime conditions which could not be heard on the other receiver used as a "check" during the tests. No extreme distant signals were heard due largely to the time of year and the hours at which the tests were made. During the test period also there was a daily thunderstorm which gave a high static level. It was noticed that while the static was heard, the noise suppressor was effective in reducing this disturbance considerably, particularly when a comparison was made with the other receiver.

On the 40-meter c.w. band during a few hours a surprising number of distant stations were logged. Among these were CM2AS, FM8AD, K6IDK, K6LKN, XE2BD, and many others. Numerous sixth and seventh district stations were heard and of course the usual large numbers of fourth, fifth, eighth and ninth district stations.

Twenty-meter 'phone reception also was good. Among the stations heard were CO6OM, CO2WZ, HI5X, HP1A, NY2AE, XE2N, YV1AC, G5NI, G5ML, HI7G, CO8YB, CO2LL, G6WD, G6XR, LU4AW, LU6AG, PY1CK, SU1CH, VO1I, VO1J, and others.

Reception conditions on the 10-meter band were not particularly good during the period of test, although more local signals were heard on the ACR-111 than could be picked up on another standard receiver equipped with 10-meter coils.

# Headphone Reception

(*Continued from page* 149)

six channels, formed as tubes, open at both ends. The length of each tube determines the corresponding resonance frequency. The length of these tubes is such that their resonance frequencies build a series of numbers, the terms of which have the proportion 2:3.

The space available inside the earcap, allows the longest channel to be about 40 cm. long, which corresponds to a standing wave of about 900-1000 cycles. The length of the following channel is about 26 cm., which corresponds to another standing wave of about 1500 cycles. As the proportion is 2:3 between their resonance frequencies, these standing waves, when generated, will beat together forming a differential wave, the frequency of which is around 500 cycles. Further, the four other channels produce standing waves of correspondingly higher frequencies so that a frequency band up to about 9,000 to 10,000 cycles is covered.

Now, in explaining the acoustical action involved, let us first look into the feature of the vibrating diaphragm itself, according to the theory developed by Lord Rayleigh. He found that the differential equation for a theoretical, thin circular diaphragm, clamped at its circumference, has a series of solutions based on a single sine-wave action at given frequencies. This explains why the vibrating elastic diaphragm is capable of having a series of resonance frequencies at which it vibrates sinusoidally with certain modes of vibrations related hereto. But let the diaphragm be acted upon by a sine-wave force of any kind capable of building up vibrations and let its frequency be varied, then at given resonance frequencies the modes of vibrations will correspond and there will be so ready a response that extra loud sounds are heard from the receiver at such frequencies. Consequent experiments indicate resonance curves which have a fundamental tone and some higher harmonics, such as shown in Figure 2. The location of the fundamental resonance is usually placed somewhere inside the frequency band used, in order to obtain a satisfactory sensitive response over the widest possible frequency range.

Imagine that the fundamental frequency of resonance of the diaphragm is 1000 cycles. Then the amplitude of this vibration will follow the conventional form of a resonance curve with a maximum in the middle and the dropping off on both sides of the 1000 cycles peak. Consequently, inside this limited frequency band the diaphragm will maintain its 1000 cycles vibration independent of the frequency of the impressed force. The amplitude, however, will vary in accordance with the resonance curve and exactly at 1000 cycles there will be correspondence between the frequency of the impressed force and the number of vibrations of the diaphragm.

We may, therefore, conclude that between the limits given by the resonance curve, the width and maximum amplitude of which is due to the elastic property of the diaphragm and the damping of the air on the diaphragm, the pitch of the sound produced by the diaphragm is the same, 1000 cycles, whether a somewhat lower or a somewhat higher frequency than that of resonance is supplied by the impressed force. Accordingly we have frequency as well as amplitude distortion within this frequency band of resonance.

The same condition will be encountered at all other modes of vibrations, although some modes of vibrations may be evoked more readily than others. It is, therefore, obvious that the problem is to design a device whereby distortion from such resonance can be decreased and it is likely that it depends greatly upon the outside conditions—for example, the way of applying the acting force and the load from motions built up in the air, etc., to what extent the diaphragm will vibrate in any desirable or undesirable way. Further, we may conclude that within each such frequency band of resonance, the vibrations of the diaphragm is entirely "forced" and even if the frequency should be just the same as that of the impressed force, the amplitude may be distorted.

The acoustical improvement obtained by the new earcap is due to the inter-action between vibrations excited in the diaphragm and the interfering standing-wave generated thereby in the tubes. This action reaches an optimum by the formation of a differential wave which is one octave below the excited fundamental if the tubes have such dimensions in relation to one another that their resonance frequencies build a series of numbers, the terms of which have the proportion 2:3.

This statement may be confirmed by adding to this rather brief discussion a few results from a series of experiments made with a standard telephone receiver, a 509-W. Western Electric, 1100-ohm, headphone, alternately equipped with two different types of earcaps, the standard one and the new earcap. The sound from the two earcaps, respectively, was picked up by a microphone and recorded with a cathode-ray oscillograph. The sound-wave curves were then compared with the impressed electrical currents passing through the windings of the headphone. If the headphone worked as a perfect converter of electric speech current into sound waves there should be found no discrepancy in the form of the waves. A combined wave produced by two sine waves beating together was used for this experiment and the corresponding results are shown in Figure 3.

In Figure 3a is shown the beats from the two electric currents flowing through the winding, the frequencies of which are in the proportion of 1:2. They are a 500-cycle and a 1000-cycle wave impressed on the telephone receiver. Figure 3b shows that the corresponding sound produced with the standard earcap and phone consists of only one single frequency of 1000 cycles. This means that the resonance in the diaphragm controls the sound vibration that there is no chance of producing any trace of the beating wave of 500 cycles.

This result, compared to the same sound reproduced with the new earcap, shows in Figure 3c that a great improvement in this respect is obtained as the original form of the combined current wave is reproduced approximately with its true form.

These results were further verified when two other frequencies in the proportion 2:3 are beaten together using a 1000 cycle resonance in the diaphragm, when the sound was reproduced with the standard earcap, which resonance entirely dominated the sound. With the new earcap there was nearly exact correspondence between the sound wave and the original current waves.

It was found, therefore, that using a combined current wave of 500 cycles and 1000 cycles, or one of 1000 cycles and another of 1500 cycles beaten together produced sounds with the standard earcap which remained the same as those from a 1000 cycle wave.

This fact explains why the aural impression of reproduction with the standard earcap is lacking the true lower-frequency response when compared to the same impression of reproduction with the new earcap.

The same experiment was repeated with the two earcaps with a 3000 cycle wave beating against a 2000 cycle wave with

the same results. The new earcap gave a much truer reproduction than the old.

The added perfection in headphone reproduction of audible signals obtained with this new earcap should, therefore, prove of considerable value in the future manufacture of aids for the hard-of-hearing and for telephone receivers for many kinds of communication traffic such as commercial telephones, interior house telephones, telephone dispatching systems, dictaphones, monitoring head-sets and for individual radio reception or for use in aviation as well as in scientific apparatus, medical stethoscopes, etc.

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# Amateur Observer

(*Continued from page* 150)

FB8AB, PAOCE, PAOJMW, PAOKV, PAOQL, VO3X, ZL1HY, ZL2DS, ZL2FZ, ZL2II, ZL2JD, ZL2MN, ZL2QA, ZL2SM, ZL3FZ, ZL4FK, YN1IP, HP1A, OA4AL, OA4AQ, SP1AO, SP1LM, K4EJF, K4SA, CT1AY, U2NE.

By Roger Legge, Jr., 45 Bodine, University of Pennsylvania, Philadelphia, Pa., on 40 meter 'phone: EA8AP, EA8AS, EA8AK, EA8AE, EA9AH, EA9BJ, F8MG, EA4PN, OA4C, HC1FC, HC1FG, LU4BC, HC1PM, HK3BK, HK3RO, HK3JA, HH2G, HH2X, HI1C, HI2K, HI2T, HI6F, HI8X, HI9I, HI9R, HI7I, VP2CD, YN2LT, TI1AF, TI2RS, TI2RC, TI2RT, TI2OFR, TI2RM, TI3AV, TI5RC, TI5RG, TI6AN, YV1AA, YV1AB, YV1AD, YV1AI, YV1AP, YV1AH, YV1AM, YV3AA, YV3AE, YV4AB, YV4AC, YV4AF, YV4AG, YV4AK, YV4AM, YV4AN, YV5AA, YV5AE, YV5AG, YV5AJ, YV5AZ, YV5ABB, YV5ABD, YV5ABE, YV5ABJ, YV5ABN, YB5ABQ, YV5ABI.

On 20 meter 'phone: ZE1JR, ZT6AL, ZS6AJ, ZU6P, ZS2N, ZS2X, FT4AG, OQ5AA, CN8MB, SU1KG, SU1CH, EA9AH, VU2CQ, PK1MX, CP1AA, CX1CC, CX2AK, SV1KE, SM5SV, CT2AB.

On 10 meter 'phone: ON4KD, F8VS, F8RR, G5KH, G5BY, G5BM, G5JW, G5AU, G5SY, G5ML, G6VX, G6LK, G6CW, G6DH, G6WU, G6GS, VO1J, HI7G, K4DDH, K4DSE, K4EPO, K4EJF, K6MVV.

By James M. Armond, 560 Grier Avenue, Elizabeth, N. J., on 20 meters: W1ADM, W2DX, W2NB, W2JKQ, W2IVK, W2CZP, W2GNS, W2HQB, W2CNR, W2BRO, W2GO, W2GIZ, W2CQD, W3FOA, W3BBP, W4EP, W4DXP, W4EGN, W4EBW, W4DYP, W4CYG, W5BDB, W5BDW, W5UN, W5HJ, W5ECT, W5ACF, W5FHJ, W6AM, W8NYP, W9IMR, W9LBM, W9MHM, W9UVP, W9TWD, W9AOM, W9LOK, W9LHF, W9BGB, W9RBI, W9TTS, W9AOF, W9BVY, W9DYE, W9MCD, W9BFL, W9ODQ, W9KF, W9DYZ, W9EKP, W9USI, W9OCG, CE3DW, CE3EW, CO2HY, CO2JJ, CO2JV, CO2KL, CO2KY, CO2LY, CO2OV, CO2WW, CO7OX, CO8OG, C08YB, CX2AK, EA8AE, G2PU, G5JO, G5ML, G6MI, HI5X, HI7G, HH2B, HH5G, HK1GK, HK1ABM, HK3AC, HK3JA, HK4AE, HP1A, HR2A, LU1DA, LU1QA, LU2CH, LU4BH, LU4BM, LU7AC, LU8AB, LY1HB, OA4AK, OA4AL, PAOBE, PAOFP, PAOGN, PAO1DW, PY8AD, SM7UC, SP1HH, TI3AV, TI3KP, VE1LI, VE2DC, VE2GO, VE2MC, VE2ADP, VE3GS, VE3YY, VE4IF, VE4FH, VE4LH, VE4OG, VE4QV, VE5AK, VE5FO, VO1I, VO1J, VO1P, VOZZ, VP9R, VP3BG, VP6YB, XE1AX, XE2AH, XE2FY, XE3AQ, YN1HS, YV1AP, YV4AA, YV5AB, YV5ABE, YV5AM, YV5AK.

By Jose Ruiz, 328 B. Aviles, Manila, Philippine Islands, on 20 meters: ZS4J, W6E2H, W6NR, CE3AW, CE1AO.

By Elmer R. Fuller, 61 Shenango Street, Binghamton, N. Y., on 20 meter 'phone: G5ML, EI3J, G5PP, HK3JA, ON4AK, W7EHJ, W7FU, W7BAH, VP9R, W7EKA, HC1FG.

On 40 meters: YN4A.

On 75 meters: TI2WD.

By P. L. Stiles, 20 Temple Sheen Rd., East Sheen. London, England: GM6RV, CT1OO, GM2DI, G6BY, SU1KG, YI7NN, SU1SG, G6XP, G2PU, G6AG, F8GY, G6IW, GM6UU, G8PH, G8NA, GM8MW, EI2M, W3ADO, W8MOL.

By Thomas P. Jordan, 1523 N. Main Avenue, Scranton, Pa., on 20 meter 'phone: LU8AB, LU2AJ, LU1QA, LU7AC, G6XR, G6ML, G5SP, G5ML, G5SA, G8LX, HK3JA, HP1A; CE1AH, CE3DW, CX2AK; OA4N, HI7G, VE1AO, VE1BR, VP5BZ, VP3BG, VO2Z, CO2LY.

On 10 meter 'phone: VP5BZ.

By Earl G. Marshal, 936 Mahoning Road, North East Canton, Ohio, on 20 meter 'phone: V3AKT, VP9R, G6TG, VECNX, OA4AK, V32CA, W2GFC, WITW, WIDGH, WIBAY, W2JKQ, W2SA, W2NXY, W3DPC, W3CHY, W4CPE, W4ASE, W4BYY, W3BWR, W4AUT, W8LEW, W9BXT, W9XM, W2HFS.

On 75 meter 'phone: W8LEK, W8BZ, W8KYA, W8KS, W8OX, W8LBR.

# Oscilloscopes

(*Continued from page* 139)

measuring percentage of modulation and checking other operating characteristics of his rig.

For service work the usefulness of the instrument is practically unlimited. Probably its most common use will be found in receiver alignment and on this application it is employed in conjunction with the RCA model 150 oscillator. A few of the instrument's outstanding features include: high sensitivity, providing a full-sized image with 1.75 volts (RMS) input; vertical and horizontal amplifiers with individual controls, rated flat over a range of from 30 to 10,000 cycles; a linear timing axis in the same range; small spot diameter for sharp focusing and individual centering controls. Five tubes are employed consisting of one 913, one 885, two 6C6's, and one 80 type rectifier.

## An Ultra-Modern Oscilloscope

THE Bendix model 3710 oscilloscope (see No. 7) has been carefully designed and constructed to provide an economical and compact instrument capable of performing a wide variety of tests. The cathode-ray tube is recessed at an angle below the surface of the front panel, eliminating the necessity of an attachable shield to keep strong external light from dimming the screen image. This modern construction provides an image of greater brilliancy at lower voltage, adding to the life of the tube. The angle mounting also places the tube more nearly at average eye level for greater convenience in use. A removable reference screen with engraved lines is mounted over the tube screen. The rated range of the sweep circuit extends from 15 to 20,000 cycles and employs the type 885 gaseous discharge tube. Vertical and horizontal amplifiers are provided, designed to enable satisfactory observation of frequencies up to 200,000 cycles with good definition. The following tubes are supplied with the instrument: two type 6C6's, one type 885, two 80's, and a 913. The unit presents an attractive appearance. The modernistic case is of welded metal construction and is fitted with a special leather handle for ease in carrying.

## New 913 Oscillograph Kit

EXPERIMENTERS, amateurs and servicemen will be interested in hearing that the Transformer Corp. of America have just made available a complete kit of parts for constructing a midget cathode-ray oscillograph using the 913 tube (see No. 8.) The kit includes all the necessary condensers, sockets, transformers, a modernistic-loooking cabinet and everything necessary to build the complete instrument. Each kit is accompanied by a set of instructions and diagrams. A few of the technical features of this new design include a wide-range vertical amplifier, saw-tooth oscillator with frequency control, built-in power supply, and complete facilities for handling all the usual cathode-ray applications. Eight controls are easily accessible and clearly marked on the front of the specially etched panel. The built-in sweep circuit uses a type 885, in conjunction with a limiting tube, a type 6K7, the vertical amplifier employs a 6J7 and an 80 type is used in the power supply.

## 2-Inch Tube in New Turret Type Mounting

THE new Triplett model 1690 oscilloscope (see No. 9) employs the new type 24XH 2-inch cathode-ray tube. The

instrument meets every requirement of the servicing engineer for the visual study and adjustment of receiver circuit problems and in addition, has invaluable applications in radio transmitter, sound equipment, industrial and educational fields. The cathode-ray tube is fitted in a novel turret-type mounting that can be moved up or down or to either side for adjustment to an angle in direct alignment with the user's line of vision. The device incorporates separately controlled resistance-coupled vertical and horizontal amplifiers. Both vertical and horizontal plates can be directly coupled with amplitude control, or through amplifiers with amplitude control. The linear sweep range is 15 to 20,000 cycles. Sweep, (either internal, external or 60 cycle) may be applied through amplifiers or direct with amplitude control for study of r.f., a.f. and other phenomena. The tube complement comprises a type 25Z5, one 885, one 6J7, one 6C6 and a 24-XH cathode-ray tube. The black leatherette-covered carrying case measuring 6⅜ by 12 by 15½ inches has a handy compartment for accessories.

## The "X-Ray" of Radio

EXCEPT for physical size and screen area, the new Clough-Brengle model 105 midget oscillograph using the 913 tube (see No. 10) is the exact electrical duplicate of their larger model CRA instrument. All the performance features have been retained in the new low-cost, midget oscillograph, such as the following: linear sweep circuit, separate high sensitivity amplifiers for both horizontal and vertical inputs, synchronizing circuit and beam centering control. This new service tool affords complete facilities for countless oscillograph applications in modern receiver servicing procedure. Its portability adds greatly to the facility of making cathode-ray studies of amplifier and transmitter conditions. Modulation checking at wavelengths as short as 5 meters can be made. When employed with their model 79B audio oscillator, frequency response, distortion, modulation, etc. can be accurately and quickly investigated. It is supplied complete with an adjustable calibrated screen and light shield and incorporates a Bedell sweep circuit with a special compensated amplifier. The sweep circuit range is from 15 to 30,000 cycles permitting observation of wave forms at frequencies up to 300,000 cycles per second. The specifications show that both amplifiers are rated flat to 100,000 cycles. Additional features are: input sensitivity, .68 RMS volts for full-screen deflection, two separate transformer windings, two rectifiers and two filter systems for the C.R. tube and amplifiers.

## Compact Unit for the Amateur

THE National model CRM oscilloscope (see No. 11) was designed especially for amateurs. "Hams" are realizing more and more that cathode-ray oscilloscopes are extremely useful for the investigation of transmitter conditions. This instrument is a simple, compact unit employing but two tubes, the 913 cathode-ray tube and the type 6X5 which is used as a half-wave rectifier in the power supply. The power unit furnishes operating voltages to the 913 tube and also a 60-cycle horizontal sweep circuit. Horizontal and vertical amplifier voltages, where required, are supplied externally. Controls are provided for brilliancy and focus, a potentiometer for controlling the amplitude of the horizontal deflection, and a built-in 60-cycle sweep. The latter is particularly convenient as it permits checking transmitter operation with no connection other than a pick-up coil.

## Low-Cost Kit

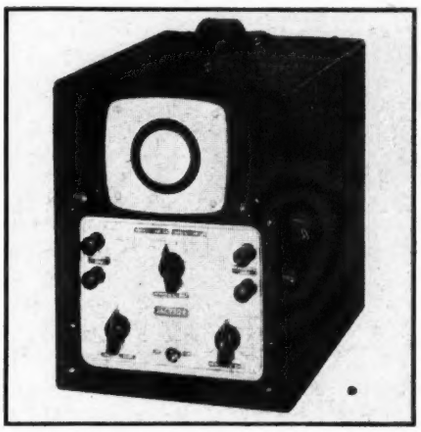
THE latest Superior Instruments Company's type OS-10 oscilloscope (see No. 12) is equipped with an adjustable hood for the type 913 cathode-ray tube, so that patterns can be viewed and analyzed without eye-strain. This instrument can be supplied either completely wired, ready for operation, or in kit form. The dimensions of the cabinet are 7½ x 10 x 10¾ inches. A neon-tube sweep circuit is employed. The five tubes utilized in the instrument are two 57s, one 80, one 913, and one G. E. neon tube.

## Condenser Kit for Midget Oscilloscope

THE Aerovox Corporation announces a special kit of condensers for the construction of the new Thordarson low-voltage, cathode-ray oscilloscope kit. The kit comprises 18 condensers of the various types, specified capacities and voltage ratings called for in the building instructions folder. Some of the units have to meet very close capacity tolerances because of the critical nature of the oscilloscope circuits.

## For Servicemen, Experimenters and Amateurs

The Jackson model 521 cathode-ray oscillograph specifications show that the instrument is equipped with a self-contained amplifier for the vertical deflecting plates to provide high sensitivity for radio testing and servicing. The approximate input sensitivity of both the horizontal and vertical plates is 40 volts per inch (r.m.s.). However, with the vertical amplifier in service,



the vertical sensitivity my be adjusted as high as 1.0 volt per inch. Amplifier gain is varied by means of a control marked directly in units of 0 to 40. The amplifier is designed to give a nearly flat response characteristic up to 100,000 cycles. A horizontal time axis of 60 cycles is provided which may be used with the voltage under test connected to the vertical amplifier or directly to the vertical plates.

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# Movie Sound

(*Continued from page* 142)

troubles are those common to theatre equipment and the audio channels of radio sets, such as open biasing resistances, transformer windings, defective condensers, etc., and will require no particular discussion here. Unmatched tubes in push-pull stages result in some distortion and frequently damage those transformers which have high permeability, nickel-alloy cores. The remedies are obvious.

It may be well to point out here, in con-

nection with power amplifiers which have a separate power supply that many shutdowns, due to blown filter condensers, can be prevented. Disconnect the entire filter block and operate, temporarily, without the condensers. Replacement of the condensers, after the trouble has been found, is frequently a difficult task because of the lay-out of the amplifier. To be able to save a show by quick, even if unorthodox, action is a commendable characteristic in a serviceman. Cases are on record where such drastic measures as cutting out the entire plate supply system and operating temporarily on "B" batteries—admittedly at some expense! Compared to losing the show, the cost was negligible and the resultant good-will was of no little value.

Theatre owners have been paying compulsory service charges for so long that their relief from this expense will make it difficult to sell a routine inspection and service. The large theatre chains have their own engineering and maintenance personnel. It will be the independent owner to whom the serviceman must look for his business, taking it as he takes radio repair and service business when something goes wrong. However, if union regulations and city laws do not prevent, it will not hurt in the least to visit the projection room of such theatres whose owners evince interest in having someone on whom they can call in an emergency. When the time comes for making a charge, *make it an honest charge!* Theatre owners are sick-and-tired of being considered "suckers" and any attempt to overcharge will quickly be resented. Theatre men by now have an excellent idea of how much the materials cost and how much a job is worth.

For some supplies, such as mechanical parts discussed above, the theatre owner will undoubtedly have a reliable source of supply. However, the serviceman who intends to go in for all phases of service will find it necessary to establish contact with a theatrical supply house. (There are many reliable concerns and, as in radio, many that are the direct opposite). When making contact, it will be well to impress upon the supplier the fact that orders must be shipped promptly. These supply houses are accustomed to expediting orders to theatres but may be inclined to let slide an order from—to them—an unknown.

## A Service Career

(*Continued from page* 136)

6-inch wire-cutting pliers, electrician's knife and a hand drill.

In the majority of instances, equipment will be acquired during the course of training, and will not, therefore, represent a single outright expenditure just before opening up shop. Thus the cost of equipment will not usually be considered in estimating the minimum capital with which one may embark, with reasonable assurance of success, upon a radio service career. However, when all or part of the equipment must be purchased, the required capital must be increased to cover it.

The smallest amount of money that will carry one through the formative stages of building up a radio service business will vary greatly with circumstances. To get anywhere at all, we must assume that the serviceman is starting pretty much from scratch, and has no other source of income or means of support. On this basis, the absolute minimum capital can be determined as follows:

| | |
|---|---|
| Estimated living expenses for 8 months ..... | $ |
| Estimated overhead for 8 months | |
| Advertising budget for 8 months.. | 35.00 |
| Stock of spare parts ..... | 90.00 |
| Stock of tubes ..... | 75.00 |
| Total ..... | $ |

The above table is arrived at on the assumption that the serviceman will be able to make a living in radio servicing after he has been established for one year. Usually this is the minimum time in which this happy condition is likely to be realized—and yet it should be possible with ambition, initiative, sidelines and plenty of indefatigability—the best of all abilities. It is figured that the business will make enough over the initial eight months to carry it, with the help of an ever-increasing income, over the remaining four months of the year and out of the red.

Living expenses will obviously vary with the individual. So will overhead. If you must rent a shop in a good location, your overhead may be high. If on the other hand you are operating from your home—a cellar or attic shop—overhead will be minimized, but something should be figured in for electricity and telephone. This is only sound business.

About 60-percent of all servicemen operate from their homes. A service bench built into a spare corner of the home is shown in the accompanying illustration. The cost of lumber for this sturdy bench was $2.57, and the fixtures 76c. Equipment in view is the Triplett Model 1540 Multi-purpose tester and a Hickok all-wave oscillator.

Some means of transportation, preferably a car, is almost indispensable. The family car, or an old second-hand purchase will suffice until the business begins to support itself.

The advertising budget covers newspaper advertising, manufacturers' literature with your own imprints, stationery, hand-outs, circulars, signs, displays, etc. By accepting the co-operation proffered by the manufacturers, this budget can be stretched to an amazing distance.

The average serviceman carries a stock of spare parts valued at $130.00 and a tube stock of $90.00. However, this can be cut as indicated when starting up. Advertising, on the other hand, cannot be reduced. Rather it should be increased during the initial months in business.

If the serviceman has another source of income, or lives with relatives, these factors may tend to lower the minimum capital. In an extreme case, such as a young man living with his parents and maintaining the shop at home, the minimum capital need only cover parts, tubes and $10.00 for advance advertising. These three items are basic minimum capital requirements and hold regardless of other sources of income and the extent to which living expenses and overhead can be reduced.

If the prospective serviceman cannot meet his particular minimum-capital requirements, his best recourse is to seek employment and service in his spare time—rather than attempt full-time servicing against these very heavy odds. If he can obtain a position as employed serviceman with some radio concern, so much the better, as the experience and contacts will be extremely beneficial to him. And it will be wise to stick to the job until he has saved well over the minimum capital required to start business "on his own."

## The "Ham" Shack

(*Continued from page* 145)

insufficient space, but are are mounted on a small panel adjacent to the transmitter and equipped with plugs so that the current in

any one of these four circuits may be measured. Two meters will suffice—one 0-25 milliampere and one 0-200 milliampere ranges.

Construction of the transmitter is not difficult providing adequate tools are available. In making the holes for the sockets in the chassis, a socket punch will be found to facilitate construction. Two or three blows with a hammer will knock out a clean-cut hole. Incidentally, the socket for the 802 is a large 7-prong affair and requires a slightly larger hole than the others.

After the chassis is laid out and all the holes are drilled and punched, all parts should be mounted on the chassis. This done, the wiring should be begun, beginning with the oscillator and working through to the final amplifier.

All leads should be made as short as possible. If this is done it is even possible to operate the transmitter on 56 megacycles, although it was not designed primarily for operation on this band. If the schematic wiring diagram is followed carefully and the parts are laid out as suggested, the constructor should have no difficulty in building this transmitter.

In making connections to the coil sockets, the most convenient terminals should be used.

There are a number of interesting points in this transmitter. The 6C5 is an excellent crystal-oscillator tube and provides more than sufficient excitation to the 802. The plate of this tube is parallel fed, thus keeping the plate voltage off the coil and condenser circuit. The cathode end of the tank coil is connected directly to the buffer grid. Measurements showed that with only 12 milliamperes current on the plate of the oscillator at 250 volts, the rectified grid current in the control grid of the 802 was slightly more than 3 milliamperes. The 802 requires only a half-watt of driving power when used as a buffer tube.

The 802 is used as a tetrode; that is, the suppressor grid (grid No. 3) and the screen (grid No. 2) are connected together. Voltage for the suppressor and screen is obtained through a dropping resistor of 25,000 ohms which is by-passed to the cathode by a .002 mfd. mica condenser. Cathode bias is used. This is obtained from a 2,500-ohm, 10-watt resistor in series with the cathode and ground, and is by-passed by a .01-mfd., 400-volt paper condenser. Incidentally the shield in the 802 is connected directly to the cathode at the socket. Also the No. 2 and No. 3 grids are connected together at the socket.

Reduced voltages for both the oscillator tube plate and the buffer plate are obtained by a voltage-divider of 100,000 ohms mounted from front to back across the chassis. The 50-watt size will just fit nicely in the 7-inch chassis if the horizontal portion of the mounting angles are cut off and new holes are drilled through the vertical section of the brackets. These are bolted at both the front and back to the chassis.

Three hundred volts is applied to the plate of the 802. This value was arrived at as an optimum value which will supply adequate excitation to the amplifier at all frequencies. The control grid voltage (Grid No. 1) should be slightly less than minus 60 volts; the screen-suppressor voltage 100-volts positive.

The 802 is capacity-coupled to the 807 amplifier stage by means of a 100-mfd. mica condenser. In wiring the two amplifier tubes in parallel, jumper wires should be connected between the plates (caps at top of tubes), grids, screens and cathodes. In the control grid home-made suppressors to prevent parastatic oscillations are used. These consist of small 1-watt, 100-ohm resistors around which are wound ten turns

of No. 20 bare wire spaced slightly between turns. These are connected directly at the socket grid terminals, one for each tube. This arrangement was devised by the manufacturer of the tubes for use in their transmitters making use of 807s.

A combination of cathode and grid leak bias is used in the amplifier stage. For a grid leak, a 20,000-ohm, 10-watt resistor is employed. The cathodes bias resistor is a 200-ohm, 10-watt unit by-passed by a .01-mfd. paper condenser. Voltage for the screen is obtained by a 5,000-ohm, 20-watt dropping resistor which in turn is by-passed by a similar paper condenser. These by-passed condensers are essential, particularly where the amplifier is to be modulated.

A center-tapped, 50-ohm resistor is connected across the heater circuit, its center terminal being connected to the cathodes of the tubes. This is desirable where a.c. is used to heat the filaments.

The plate-tank coils are center-tapped and by-passed to ground. This arrangement facilitates the use of a single-section tuning condenser and at the same time assures neutralization over a wide range of frequencies so that, once neutralization is adjusted on one band, it will not have to be adjusted when changing to another band.

Four hundred volts are applied to the plates of the 807s. When properly adjusted and loaded up by an antenna, the plate current should be about 180 milliamperes. This is slightly more than 70 watts input, a sizeable amount for such a small unit. The screen voltage should be about 250 volts, and the grid voltage about minus 50. The grid current should be between 6 and 8 milliamperes. It was found desirable not to drive the grids of the 807s too hard, as this resulted in instability and no added gain in output was obtained beyond the optimum value recommended by the tube manufacturers.

Any type of crystal may be used satisfactorily in the 6C5 oscillator circuit. Good results were obtained from 20-meter crys-



## INDEX OF ADVERTISERS

## RADIO BEGINNERS!

All installments of "The Radio Beginner" which appeared in RADIO NEWS from May 1936 to June 1937 are included in the new book "34 Lessons In Radio And Television"—together with other valuable data on radio and television which could not be included in the original lessons due to space limitations.

This valuable book will guide you, step by step, in clear, easy-to-understand language, from the elementary theories of radio to the intricate problems involved in constructing modern radio receivers.

Get your copy of "34 Lessons In Radio And Television" now—take advantage of our special offer on Page 189 of this issue.—RADIO NEWS.

tals—as good as with 75-meter units. The 802 also may be used as a doubler or quadrupler; this providing flexibility in operation on the higher frequency bands from a minimum number of crystals. For instance it is possible to operate on 160 and 75 meters with a 160-meter crystal; on 40, 20 and 10 with a 40-meter crystal.

All of the coils are wound on standard-size coil forms (Hammarlund) with the exception of the amplifier coils for 160 and 75-meter bands. These are large sized forms, 2¼ inches in diameter. The oscillator and buffer coils are connected so they are interchangeable. In each case the filament terminals of the four-prong bases are used for the coil connections. This practice also was followed in the amplifier coils. The center-tap was brought to the "grid" terminal of the socket. The coil-winding data is shown in the accompanying chart.

The essential constructional details of this transmitter have been covered here. Next month in the "Ham Shack," tuning and operating details and a report on results obtained under practical operating conditions will be discussed.

### List of Parts

1 Terminal chassis, 7 by 13 by 2 inches
3 5-prong sockets, Amphenol
3 4-prong sockets, Amphenol
1 7-prong socket (large), Amphenol
1 Metal tube socket, Amphenol
4 .002-mfd. mica condensers, Aerovox
3 .01-mfd, 400-volt paper condensers, Aerovox
2 0-100-mfd. variable condensers, Hammarlund
1 .0001-mfd. mica condenser, Aerovox
1 0-150-mfd. variable condenser, Cardwell
1 15-mmfd. midget variable (with detachable plates), Cardwell
1 50,000-ohm, 1-watt resistor, Ohmite
1 2,500-ohm, 10-watt resistor, Ohmite
1 25,000-ohm, 20-watt resistor, Ohmite
1 200-ohm, 10-watt resistor, Ohmite
1 50-ohm center-tapped resistor, Ohmite
1 20,000-ohm 10-watt resistor, Ohmite
1 5,000-ohm, 20-watt resistor, Ohmite
1 100,000-ohm, 50-watt resistor, Ohmite
4 closed-circuit jacks, Bud
4 radio-frequency choke coils, National
Necessary coil forms and hardware

## The PR-15

(*Continued from page* 145)

Calif., incorporates all of these features in its design. It is designed primarily as a low-cost unit and has all of the 1937 developments that contribute toward better all-around performance.

The receiver is self-contained in a metal cabinet having only the loudspeaker as an external unit. It has a frequency range of 575 kilocycles to 40 megacycles which is covered in five bands. The five ranges include all of the amateur bands excepting five meters and also include police, short-wave broadcasting, aviation stations and standard broadcasting channels. The five bands are: one, 550 to 1,700 kilocycles; two, 1.7 to 5.5 megacycles; three, 5.5 to 12 megacycles; four, 11 to 22 megacycles and five, 18 to 40 megacycles.

As the name implies, fifteen tubes are used, eleven of which are metal types and four are "metal-glass" types. The receiver circuit is a superheterodyne with two stages of radio-frequency pre-selection which use 6K7s; one 6A8, as a modulator or mixer tube; one 6K6G as an electron hetrodyne oscillator; one 6K7, as a first intermediate-frequency amplifier; one 6L7 as a second intermediate-frequency stage and noise-silencer injector tube; one 6Q7 as second detector, AVC and first audio stage; one 6K7 as a noise-silencer amplifier, one 6H6 as a noise-silencer rectifier; one 6N7 as an automatic-threshold tube; two 6V6gs as audio-output tubes in push-pull; one 6J7 as an inter-channel, noise-suppression or relay tube; one 6C5, c.w. beat oscillator tube and one 5X4G rectifier tube.

Twelve controls are mounted on the front

panel. These include the main tuning dial and its vernier drive. The main tuning control which operates a 4-gang 8-section type (split-stator) tuning condenser is mounted at the center of the front panel. This dial is controlled by a mechanical band-spread mechanism that provides a ratio of 25 to 1. In addition a separate vernier drive, that gives a tuning ratio of 400-1, is provided.

Other controls on the front panel are: tone control and AVC switch, communication switch for standing by during transmission periods; crystal filter switch, phasing control, audio volume control, band selector switch, manual a.v.c. switch, beat-oscillator switch, "silent between station" switch, noise-suppression control and beat-frequency oscillator pitch control.

One of the interesting electrical features on this receiver is the crystal-filter design. This circuit is equipped for two different adjustments—one for 'phone reception and the other for telegraph reception. The former which is designated as a "band-pass type" permits continuously variable bandwidth from approximately 10 to 2 kilocycles. The other crystal arrangement is the conventional series parallel unit that affords the high degree of selectivity for c.w. reception. The crystal components are separately shielded.

Another feature is what is described as "inter-channel noise suppression" which provides "silence between stations." This unit may be switched in or out of any band at will by means of the control on the front. It may be adjusted to open on a signal of any "R" strength and useful when it is desired to keep the receiver tuned to a given station during a stand-by period.

An "R" meter is mounted on the front panel, adjacent to the tuning dial. This meter is an integral part of the second intermediate frequency amplifier circuit. Another electrical feature of this receiver is the noise suppressor which was mentioned under the list of tubes. This silencer circuit is designed to reduce noise caused by car ignition systems and electrical appliances and is particularly helpful in receiving stations on the higher frequency bands where this form of interference is a problem without some suppression device.

Iron core intermediate-frequency transformers, tuned to 465 kilocycles, are used. These provide a high degree of selectivity.

The receiver is designed to be operated with a 12-inch external loudspeaker. The use of the beam-power tubes in the push-pull audio circuit provide ample power for all requirements, with excellent frequency response. Power, 15 watts with less than 2-percent harmonic distortion is provided. The frequency response is essentially flat from 50 to about 8,000 cycles, according to the manufacturer's graphs, and flat to slightly more than 4,000 cycles when the receiver is set for minimum band width.

Another feature is the inclusion of a "push-to-talk" system which consists of a jack at the rear of the chassis for break-in use. Provision also is made for the use of either a doublet type antenna or antenna-ground arrangement.

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# What's New in Radio

(*Continued from page* 137)

## Compact Etched-Foil Condensers

The photograph shows the comparative sizes of the new Cornell-Dubilier etched-foil type dry electrolytic condenser and the equivalent-capacity plain foil unit. The new condensers are available in both metal

and cardboard containers in capacities ranging from 4 to 16 microfarads, including the popular multiple types rated at 200 to 525 volts.

## New Signal Generator

The Radio City Products Co., Inc., have announced their new model 701 all-wave signal generator. The rated frequency range is from 125 kc. to 60 mc. with five bands covering from 125 kc. to 15 mc. on funda-

mentals. A five-step ladder attenuator is provided, designed to give outputs adjustable from ½ volt to 1 microvolt. Modulation at 400 cycles may be employed externally as well as internally. It is low-priced yet carefully shielded and ruggedly constructed.

## 11-Tube Super with Automatic Dialing

Automatic dialing is one of the outstanding features in the Allied "Knight" 11-tube receiver shown in the accompanying

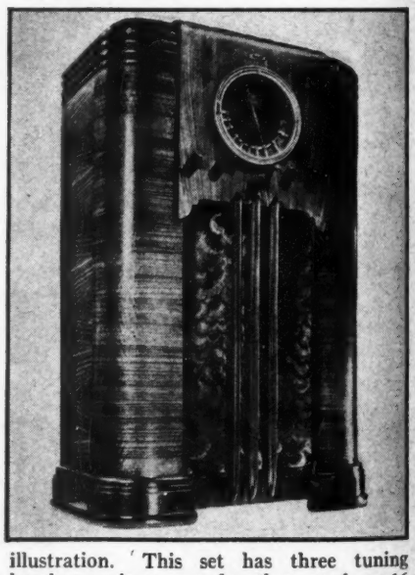

illustration. This set has three tuning bands covering a wavelength range from 16 to 560 meters. Other features include: large color-band dial, 9 watts power output, 12-inch speaker, automatic-frequency control, and a double push-pull audio system.

## Higher Power for Canada

Toronto, Canada—The Canadian Broadcasting Corporation is planning to construct two new 50-kw. transmitters; one near Montreal, and the other near Toronto. They are expected to be in operation by October 1, 1937. Additional high-powered stations are expected to be located in the Maritime Provinces and in western Canada.


## ONLY MIDWEST'S DIRECT-FROM-FACTORY POLICY MAKES THIS AND OTHER SENSATIONAL FEATURES POSSIBLE AT AMAZINGLY LOW PRICES!

**30 DAYS FREE TRIAL**

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**Only $49.95**

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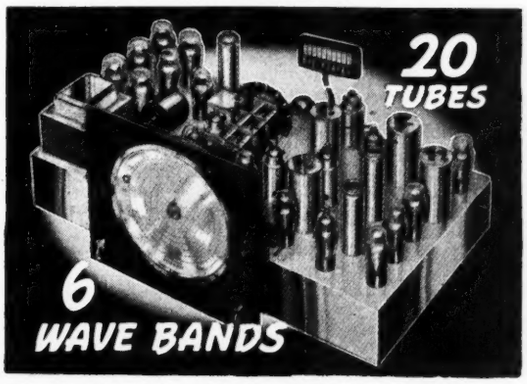


## 20 TUBES FOR PRICE OF 10

Why be content with an ordinary 10, 12 or 14-tube set, when you can buy a 20-tube Super DeLuxe ELECTRIC TUNING Midwest for the same money! It will surprise and delight you with its brilliant world-wide reception on 6 bands. You save 50%—and get 30 days *free* trial in your own home—when you buy direct from the factory at wholesale prices. You are triply protected with Foreign Reception Guarantee, One-Year Warranty and Money-Back Guarantees.

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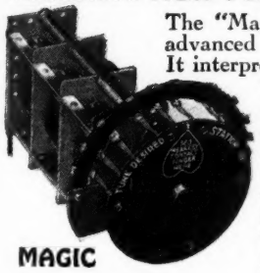
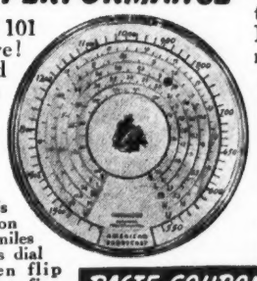


MAGIC MYSTIC BRAIN

The "Magic Mystic Brain" is just one of 101 advanced features, many of them exclusive! It interprets your touch button signals and controls the electric motor. Nine contact fingers can be easily set to any stations you desire. Even a child can do it!



### MAGIC MOVIE DIAL

Now, you can delight in the world's finest six-continent overseas reception with a range of 12,000 and more miles (125 to 20,000 KC.) Note that chassis dial shows only broadcast band. Then flip 6-wave band switch, and, instantly, five additional bands are projected on the dial.

## TERMS AS LOW AS $1.00 A WEEK

You have a whole year to pay for your Midwest on the easiest and most convenient credit terms. Never before have you been offered so much radio for so little money—and on such easy terms!

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Imagine the sheer pleasure of working the crowded bands of today with this revolutionary new band spread, which with the outstanding new selectivity of the Super Sky Rider permits a degree of station separation on short waves that has never been available before.

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**FEATURES**

- ★ 5 to 550 Meters Coverage
- ★ 6 Bands
- ★ 11 Tubes
- ★ Wide Range Variable Selectivity
- ★ Better Than One Microvolt Average Sensitivity on All Bands
- ★ Improved Crystal Filter Control
- ★ 1000° Electrical Band Spread
- ★ "S" Meter
- ★ 13 Watt Undistorted Output
- ★ Air-Trimmed R.F. Circuit
- ★ Improved Expanding I.F. Transformers

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